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THE TABANIDAE OF PANAMA

by

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### INTRODUCTION

In 1942 I published the last of 10 papers on the Tabanidae of the Republic of Panama, which summarized what was then known of the fauna (Fairchild 1942). In that paper I listed 25 genera and subgenera and 91 species, subspecies and varieties as having been collected within the Republic. During the subsequent years until the end of 1969, I continued to collect Tabanidae in Panama and published short papers describing new species. Upon retirement in 1969, I continued work on Neotropical Tabanidae, but published only one paper specifically on Panamanian species, though including occasional such species in revisionary publications.

The present effort is designed to be a synopsis of the family as it occurs in Panama, including keys to genera and species, geographic distribution, hosts, biting habits, seasonal distribution and everything available bearing on the habits and ecology. The discerning reader will quickly observe that little except the taxonomy is included, largely because little else is available in published form. Only 3 publications are concerned with the early stages; 1 has no descriptive content, 1 treats of a single species, the last treats all early stages of known Neotropical species, 47 species, of which 21 are Panamanian (Goodwin and Murdoch 1974). There is one limited publication on seasonal distribution, another on arboreal species, and a dozen or so scattered observations on biting and host preference inserted in largely taxonomic publications.

It is hoped that this review will furnish a taxonomic backstop for anyone wishing to pursue studies on the biology and ethology of these large and conspicuous flies. Such aspects as mating habits, oviposition and larval habitats, larval food, occurrence of autogeny, host seeking behavior, including choice of host and preferred sites on hosts for feeding, length of various stages, range of flight, and preferred habitats of adults all suggest themselves as virgin fields for study.

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Pedro Galindo, whose field crews collecting mosquitoes in connection with their long term studies of Sylvan Yellow Fever have contributed most of what is known of the arboreal Tabanidae in Panama. Much of the material reported as collected at light or in horse baited mosquito traps was furnished by Marvin Keenan, the long time civilian sanitary engineer with the Environmental Health office of the U. S. Army on the Isthmus, and the successive Army entomologists working at that facility, the late Col. Stanley J. Carpenter, Maj. Gordon Field, Col. F. S. Blanton and Maj. Wallace Murdoch. During the early 1960's the Office of Interoceanic Canal Surveys made extensive collections, using Malaise traps and other methods, on several of the routes proposed as alternative sea-level canals. Gorgas Memorial Laboratory was contracted by OICS to determine the organisms from mammals to viruses, likely to be of public health interest. Much of the personnel on this survey were Army entomologists under the leadership of Maj. Bruce Eldridge. He and Lt. David G. Young collected long series of Tabanidae from areas never before sampled. During the early years of my stay in Panama, the late Prof. Joseph Bequaert provided indispensable taxonomic guidance, a position later (and still) occupied by Drs. C. B. Philip and L. L. Pechuman. Finally my colleague Richard Wilkerson has provided indispensable logistic support in the final stages of preparation of this review.

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#### EXTENT OF COLLECTIONS AND COLLECTING METHODS

The material on which this study is based was, for the most part, collected in a somewhat haphazard manner over a period of about 30 years. My predecessor at Gorgas Memorial Laboratory, L. H. Dunn, did some collecting and his collection, determined by J. S. Hine and J. Bequaert, formed the starting point for my own collecting. From 1938 to 1942 most specimens were netted by myself in the vicinity of the Canal Zone, or on short excursions to accessible sites such as El Valle de Anton, Cerro Campana, and Boquete, Chiriqui. Only 1 systematic collection was made during this period (Fairchild 1942), consisting of 26 fortnightly collections of 2 days each. Collections were made from bait animals, horses and cattle, and totalled 11,997 specimens belonging to 35 species. The collecting site was in an area of second-growth forest adjacent to swamps bordering the Chagres River, and is the only large collection available from this lowland habitat. During this period I also examined the Hine Collection at Ohio State University, and the collections at U. S. National Museum and Museum of Comparative Zoology at Harvard, from which I abstracted records of Panamanian species. This early work was reported in a series of papers, summarized in a resume (Fairchild 1943) which listed 89 species as occurring in Panama.

With the commencement of World War II, intensive work on Tabanidae closed. Time and transportation for collecting became unavailable, so that what little collecting was done was incidental to other work. Various colleagues, both in and out of the Army, continued to secure specimens in areas that had not been sampled before, mostly in connection with malaria mosquito surveys at scattered Army outposts.

During the war I had become associated with Marshall Hertig, and we had embarked on a study of the Phlebotomine sand flies. This work continued into the 1960's and the Phlebotomines being of more public health significance than Tabanidae, occupied much of my time, although enabling incidental collections of Tabanids to be made as opportunity offered. An outbreak of Sylvan Yellow Fever in late 1949 turned the attention of my colleagues, Harold Trapido and



Pedro Galindo, towards study of possible arboreal mosquito vectors of this disease. To study these mosquitoes, platforms were built in the forest canopy at heights of up to 90 feet, and collectors stationed on them. The collectors were instructed to take all insects attracted to them, and in this way a remarkable assortment of arboreal Tabanidae was secured. Collections were made at 5 localities: Progreso, Chiriqui Prov., elevation 300-400 feet, June-December, 1950; Santa Fe, Veraguas Prov. elevation 2000 feet, May-August, 1950; Cerro Campana, Panama Prov., elevation 400, 1200, and 2100 feet, February 1949-January 1950; Almirante, Bocas del Toro Prov., elevation 600 feet, 1951-1953. At each locality from 1 to 4 tree platforms were used, and simultaneous ground level and canopy collections made on a weekly basis. In addition to these Panamanian localities, similar stations were manned near Villa Somoza, Nicaragua; Lancetilla, Honduras; and Teapa, Tabasco, Mexico. These yielded a wealth of comparative material, the Honduras stations being operated for nearly a year.

Similar collecting stations were also operated, but only for short periods, in several localities in the Canal Zone. All the stations were necessarily in areas of heavy forest. The catches from the Panamanian stations were summarized in 1953 (Fairchild 1953). Since the purpose of this work was to collect diurnal mosquitoes, the stations were generally manned only from 8 am to 4 pm so that possibly crepuscular or nocturnal species were seldom taken. The station at Almirante yielded the most material, as it was run almost continuously for two years, and for shorter periods in subsequent years.

Later, in the 1950's and 1960's, in connection with continuing surveys for Sylvan Yellow Fever, and surveys for ectoparasites, camps were set up in a number of isolated areas in Darien and Bocas del Toro provinces. These were operated, with tree stations, for periods of several months. They were supplied by helicopter, and permitted sampling of areas at higher elevations, practically unreachable without this support. While most of the collecting was done by hand with small nets and human bait, light traps of several sorts were used at times, and the Shannon trap was used extensively. This is a box-like affair of netting, open below and with a central panel reaching the ground. It had no device for holding insects, so had to be visited at short intervals to remove the temporarily trapped insects.

During the years subsequent to about 1946, Army entomologists on tours of duty with what came to be known as the Environmental Health Branch, undertook surveys for biting insects in the Canal Zone and Panama. Their work included extensive use of horse-baited mosquito stable traps and New Jersey light traps. Field teams and trained laboratory technicians sorted the large numbers of insects collected, turning over to us the Tabanidae and Phlebotomine sandflies. The great majority of specimens of Tabanidae were taken in the horse-baited stable traps, and since most of these were being used to measure populations of *Anopheles* mosquitoes close to inhabited areas, the bulk of Tabanidae belonged to a few common lowland species. The light traps caught far fewer tabanids, but a greater variety, including males of a number of species not otherwise taken.

The problem of storing the large collections secured was not satisfactorily solved until within a few years of my leaving Panama. Until some years after WWII, no air conditioning was available at Gorgas Memorial Laboratory so that I took the bulk of the collections to the U. S. A. every 1 or 2 years, depositing most of them at the Museum of Comparative Zoology at Harvard University. When air conditioning was installed, specimens seemed to last well, and most material was kept either pinned in Schmitt boxes, or stored dry in pill boxes.



Later the bulk of the collection was kept in 48 glass topped drawers, duplicates in about 50 Schmitt boxes and several thousands more unpinned in pill boxes of various sizes stored in tin cans.

At first, most specimens were pinned; later only the rarer ones or those from unusual habitats, the remainder being recorded and discarded or a sample saved unpinned. Holotypes of nearly all species are deposited in M. C. Z., the remainder still in my collection for eventual deposit in M. C. Z. and Florida State Collection of Arthropods. Paratypes have been sent to various museums and colleagues, though on no consistent basis. Though no exact tabulation has been made, it is believed that about 200,000 specimens from Panama have been seen and identified.

### CHARACTERISTICS OF THE FAUNA

In this treatment 152 named forms of Tabanidae are included as occurring in the Republic of Panama, including the former Canal Zone. These are distributed in 3 subfamilies 5 tribes and 35 genera and subgenera. This is a comparatively rich fauna; but since intensive collecting has not been done in comparable areas, comparisons may reflect effort to some extent rather than actual diversity. Trinidad (Fairchild and Aitken 1960) has 45 species, and Costa Rica 90 (Hogue and Fairchild 1974), while Wilkerson (1979) reports 158 species from the three northwestern departments of Colombia. The whole United States boasts 3 subfamilies, 7 tribes, 31 genera and 282 species (Philip in Stone et al 1965), considerably less than twice the number of species found in Panama though with an area many times as great.

In 1939 when collecting really started in Panama, only 30 species were known. Of the 122 species subsequently found, 59 proved new and were described almost wholly from Panama specimens. In spite of this richness, the fauna is not a peculiar one. The percentage of precinctive species is quite low, about 15%, and most of these are species likely to be found elsewhere when searched for in their restricted habitats.

Comparison with the Neotropical fauna as a whole, shows the Panama fauna to be deficient in Pangoniinae, particularly Pangoniini. Eleven percent of the total fauna are Pangoniinae versus 26% for the whole Neotropical fauna. Chrysopsinae are about the same, 8% for the Neotropics, 9% for Panama. In the Tabaninae Panama is correspondingly richer, 78% vs. 65% for the Neotropics. Of the 2 tribes, Diachlorini and Tabanini, the former greatly outnumbers the latter in the Neotropics as a whole, while in Panama there are only about twice as many Diachlorini as Tabanini. I have the impression that the relationship between the 2 tribes continues to change in favor of Tabanini as one moves west and north. Certainly in America north of Mexico the Diachlorini form an insignificant percentage (0.6) of the Tabaninae.

Perhaps a more interesting way of looking at the fauna as a whole is by habitats. Though the data do not lend themselves to very detailed consideration, certain broad correlations seem evident (see map p. 137).

The forest environment, especially the wetter areas along the Atlantic coast and in the mountains over 1000 ft. elevation, appear to have the largest number of species, 105 or about 71% of all species. Of the 17 Pangoniinae, all but 3 species of *Esenbeckia* are forest species; all but 3 of the 14 Chrysopsinae are primarily forest species; only 15 of the 56 Diachlorini are not primarily forest inhabitants, but only 18 or 50% of the 36 Tabanini are forest species, and many of these are taken outside the forest with some frequency.



Consideration of the non-forest species shows many to be restricted to a single well-defined habitat. For example, 1 **Chrysops**, 5 **Stenotabanus** and 6 **Tabanus** species are beach or mangrove haunting species. Another dozen species, none Tabanini, are closely associated with freshwater swamps. The species which occur widely in many habitats, especially open country, either natural or man-made, include 2 **Esenbeckia**, 2 **Chrysops**, 1 **Diachlorus** and 13 **Tabanus** species. All but 2 or 3 of these are widespread, common, lowland species occurring throughout much of tropical America.

The distribution and composition of the group of 22 precinctive species is also somewhat curious. Only 6 of these are species of **Tabanus**, but of the 6, 5 are closely associated with mangrove swamps and the remaining one may be also. The 3 precinctive Pangoniinae are all forest species, one of the 2 precinctive **Chrysops** is a forest species, the other strictly confined to mangrove swamps. The remaining 11 precinctive species are all Diachlorini, 2 certainly and 2 probably from beach or mangrove environments, the remainder all forest species. I suspect that the high proportion of precinctive halophilous species is due to neglect of this habitat by collectors, but the lack of any Diachlorini in this habitat other than species of the chiefly Caribbean **Stenotabanus (Aegialomyia)** is surprising.

To sum up. The Pangoniinae are mostly forest species and mostly relatively widespread, only 3 or 4 being so far confined to Panama. The Chrysopsinae are moderately well represented, mostly by forest species, and none are very abundant as individuals. Only 1 or 2 are at present confined to Panama. The bulk of the fauna belongs to the Diachlorini, very predominantly forest species, but only a few species can be considered really abundant. Many are arboreal and a fair number nocturnal or crepuscular. Diachlorini also tend to be rare in collections, either through true scarcity or because of undiscovered habits or habitats. Of the 56 species, 13 are known from 5 or fewer specimens, while among the 35 Tabanini only 3 are known from so few specimens. Only about half as many species of Tabanini occur, but they will generally vastly outnumber the Diachlorini in numbers of individuals, especially in collections made in open or cultivated country. Numerically the Tabanini are dominant, except in dense forest, the bulk of the specimens belonging to a few common and widespread species.

#### ARBOREAL SPECIES

Included in this list are those species which are primarily arboreal, that is, most of the available specimens were taken by collectors stationed on platforms built in the forest canopy, from 40 to 90 feet above ground level. Collections were made in this habitat sporadically over a number of years (as detailed previously under collecting methods) for the purpose of collecting canopy frequenting mosquitoes, so that Tabanids were collected only incidentally. These collections, with few exceptions, were made during daylight hours, so that crepuscular or nocturnal species were not usually taken. In 1953 (Fairchild 1953) I published a short note on this subject, with a list of the arboreal species then known from Panama. Subsequent collecting has confirmed most of the species there listed as arboreal, but added only a few others.



- Fidena eriomeroides** Lutz. Of 7 specimens seen, 4 were taken in the forest canopy and at least 2 of the others may have been.
- Fidena trapidoi** Fchld. In 1953 I reported this as 42.3% arboreal; subsequent collections suggest this figure is low, and the species better than 50% arboreal.
- Stibasoma panamensis** Curran. Of 24 specimens on which habitat information was recorded, 16 were taken in the forest canopy.
- Stibasoma apicimacula** Fchld. Twenty-six of the 28 specimens with adequate information were taken in the canopy.
- Stibasoma flaviventre** Macq. Where information is available, specimens were usually recorded as taken in the forest canopy. The subspecies **pulla** Fchld. & Aitken from Trinidad is almost entirely arboreal (Fairchild and Aitken 1960).
- Stibasoma fulvohirtum** Wied. Highly arboreal, at least 90% of all available specimens from forest canopy.
- Dichelacera regina** Fchld. About half the available specimens were taken in the forest canopy.
- Dichelacera crocata** Fchld. The most highly arboreal species of **Dichelacera**.
- Dichelacera submarginata** Lutz. Frequently taken in the forest canopy, but also at ground level along forest margins.
- Catachlorops (Psalidia) umbratus** Hine. Nearly all specimens seen taken in forest canopy.
- Stypommisa maruccii** Fchld. Almost entirely arboreal.
- Stypommisa jaculator** Fchld. Predominantly arboreal.
- Philipotabanus grassator** Fchld. The few specimens seen were all taken in the forest canopy.
- Philipotabanus magnificus** Kroeber Predominantly a ground level species, though often taken in the canopy.
- Philipotabanus (Melasmatabanus) fascipennis** Macq. The few Panama specimens were all taken in the treetops.
- Philipotabanus (Mimotabanus) inauratus** Fchld. Probably largely arboreal.
- Philipotabanus (Mimotabanus) phalaropygus** Fchld. The few known specimens from Panama were from the canopy.
- Tabanus xenorhynchus** Fchld. Predominantly arboreal.
- Tabanus defilippii** Bell. Highly arboreal.
- Tabanus polyphemus** Fchld. Probably arboreal, though data inconclusive.

The species listed above suggest that arboreal habits are rather widespread in Panama Tabanids, as the list represents nearly 14% of the known Panama species. There seems also a tendency for arboreal species to be brightly colored, and to resemble Hymenoptera or Diptera of other families. The bulk of the arboreal species are Diachlorini, with only 2 Pangoniinae, no **Chrysops**, and but 3 Tabanini. Only the genus **Stibasoma** seems to be exclusively arboreal. In this connection, I must mention the work of Goodwin and Murdoch (1974) who found that larvae of 4 species of **Stibasoma** were taken only in Bromeliads, in 3 cases only epiphytic species.

#### NOCTURNAL AND CREPUSCULAR SPECIES

The data on which the following list is based are exceedingly fragmentary, as little collecting designed to secure this type of information has been done, nor has the time of day when specimens were collected often been recorded. A



small series of night collections were made at the Almirante Yellow Fever Station, a great deal of material taken in New Jersey light traps was studied, and scattered observations were made as opportunity offered. The taking of males in light traps is not considered evidence that the females are also nocturnal, as evidence is available that males of many species whose females are known to be active by day are frequently thus taken, i. e. *Tabanus lineola* (Richardson and Wilson, 1969) in the U. S. A. It also appears to be true that some species, abundant by day, will continue to attack late into the evening, while primarily crepuscular species may be active on overcast days, or in deeply shaded habitats. Many species taken only in stable traps, Malaise or Shannon traps may be crepuscular or nocturnal but information is not usually available as to times when traps were emptied.

It is perhaps notable that of 17 species of Pangoniinae known from Panama, 6 or about 33% are crepuscular, and of 77 Diachlorini 14, or 18% are crepuscular. None of 14 species of Chrysopsinae and only 2 of 37 species of Tabaninae are crepuscular. Pangoniinae and Diachlorini are poorly represented outside the tropics, while the preference of temperate species of *Tabanus* and *Chrysops* for bright sunny weather has frequently been noted and the subject reviewed by Burnett and Hayes (1974). Although daylight temperatures in temperate regions are frequently as high or higher than in the tropics, night temperatures are far more likely to fall below the threshold of insect activity outside the tropics.

*Esenbeckia osornoi* Fchld. Definitely nocturnal and crepuscular.

*Esenbeckia translucens* Macq. Specimens were taken on one occasion late in the evening biting a horse.

*Scione rufescens* Ric. Definitely crepuscular and nocturnal, flying just after sunset and before dawn.

*Fidena schildi* Hine. Twice taken before dawn, and possibly primarily crepuscular.

*Fidena rhinophora* Bell. Taken biting man and pigs on two occasions before dawn, with *F. schildi*.

*Pityocera festae* Giglio.-Tos. Crepuscular.

*Chlorotabanus inanis* Fab. Nocturnal. Both sexes frequently at lights.

*Chlorotabanus mexicanus* Linn. Nocturnal. Both sexes in light traps.

*Cryptotylus unicolor* Wied. Nocturnal.

*Cryptotylus chloroticus* Phil. & Fchld. Nocturnal.

*Bolbodimyia erythrocephala* Big. One was taken between 6 and 7 P.M., most of the remainder in stable traps. This and the other 2 Panamanian species may be crepuscular or nocturnal, but data are not adequate for certainty.

*Selasoma tibiale* Fab. Nocturnal.

*Phaeotabanus phaeopterus* Fchld. Nocturnal. Both sexes at lights.

*Phaeotabanus longiappendiculatus* Macq. Nocturnal.

*Philipotabanus pallidetinctus* Kroeber. Crepuscular.

*Philipotabanus chrysothrix* Fchld. Crepuscular and/or nocturnal.

*Philipotabanus magnificus* Kroeber. Often crepuscular or nocturnal.

*Philipotabanus pterographicus* Fchld. Probably nocturnal.

*Philipotabanus ebrius* O. S. Crepuscular and/or nocturnal.

*Philipotabanus* (*Melasmatabanus*) *criton* Kroeber Probably nocturnal.

*Tabanus quinquepunctatus* Hine. Taken only in light traps.

*Tabanus unipunctatus* Big. Crepuscular and taken biting mules at night.



## HOSTS

So far as I am aware, all the Tabanidae known from Panama are haematophagous in the female sex. If non-blood feeding species occur, they must be either very rare or with habits or habitats not easily or often sampled by the numerous entomologists who have visited Panama.

The sources of blood for any kind of haematophagous insect other than true ectoparasites must usually be gleaned from scattered field observations, as only in the cases of known or suspected vectors of serious disease is it worth the time and effort needed to utilize techniques yielding information from the blood meals contained in captured females. In Panama this has not been done, so that our knowledge as to host preferences is fragmentary and largely inferred. It is known that most arthropods which feed on vertebrate blood are attracted by CO<sub>2</sub>, and Tabanids are no exception. But the observation that a species of Tabanid was taken flying about a collector or a bait animal—sources of CO<sub>2</sub>—is no guarantee that that species will habitually or even occasionally feed on that host. Conversely, if a species of Tabanid is regularly taken within an animal baited trap in a replete condition, it can usually be assumed to have fed on the bait animal. In the following lists the species actually collected while feeding on a host (1) taken in an animal baited trap (2), or netted while flying about the bait animal or the collector (3), are indicated by the appropriate numbers (Species not listed below are without host data or taken in Shannon, Malaise, or light traps only).

**Esenbeckia (Proboscoides)****ecuadorensis chagresensis(3)**

horse, cattle

**Esenbeckia (Esenbeckia)****translucens (1, 2)**

horse, man

**Esenbeckia (E.)****prasiniventris (1, 2)**

horse, cattle, man

**Esenbeckia (E.)****osornoi (2)**

horse

**Fidena eriomeroides (3)**

man

**Fidena rhinophora (1,3)**

pig, man

**Fidena auribarba (1,3)**

man

**Fidena flavipennis (1)**

snake, cayman

**Fidena schildi (1,3)**

pig, man

**Fidena trapidoi (3)**

man

**Fidena howardi (3)**

man

**Scione maculipennis (1,3)**

man, horse

**Scione costaricana (3)**

man

**Scione rufescens (3)**

man

**Scione ablusus (1)**

man

**Pityocera festae (1,2,3)**

horses, man

**Chrysops alleni (3)**

man

**Chrysops auroguttatus (1,2,3)**

man, horse

**Chrysops calogaster (3)**

man

**Chrysops chiriquensis (3)**

man

**Chrysops melaenus (1,3)**

man, horse

**Chrysops scalaratus (1,3)**

man, horse

**Chrysops soror (3)**

man

**Chrysops variegatus (1,2,3)**

man, horse

**Stenotabanus obscurus (3)**

man



<b>Stenotabanus (Aegialomyia)</b>	
<b>changuinolae</b> (1)	man
<b>Stenotabanus (A.) littoreus</b> (1)	man
<b>Stenotabanus (A.) paitillensis</b> (1,3)	man
<b>Stenotabanus (Brachytabanus)</b>	
<b>longipennis</b> (1)	man
<b>Diachlorus curvipes</b> (1,2,3)	man, horse
<b>Diachlorus jobbinsi</b> (1,2,3)	man, horse
<b>Bolbodimyia philipi</b> (2)	horse
<b>Selasoma tibiale</b> (2,3)	man, horse
<b>Chlorotabanus inanis</b> (2)	horse
<b>Chlorotabanus mexicanus</b> (1,2)	pig, cattle, horse
<b>Phaeotabanus</b>	
<b>longiappendiculatus</b> (1)	horse, cattle
<b>Dichelacera (Dichelacera)</b>	
<b>crocata</b> (1,3)	man
<b>Dichelacera (D.) fasciata</b> (1,2,3)	man, horse, sloth
<b>Dichelacera (D.) marginata</b> (2,3)	horse, man
<b>Dichelacera (D.) regina</b> (3)	man
<b>Dichelacera (D.) rex</b> (3)	man
<b>Dichelacera (D.)</b>	
<b>scapularis and var.</b> (2,3)	man, horse
<b>Dichelacera (D.) submarginata</b> (3)	man
<b>Dichelacera (Desmatochelacera)</b>	
<b>transposita</b> (3)	man
<b>Catachlorops (Psalidia)</b>	
<b>umbratus</b> (3)	man
<b>Catachlorops (P.)</b>	
<b>fulminea and f. ocellata</b> (3)	man
<b>Dasychela badia</b> (1,3)	man
<b>Stibasoma apicimacula</b> (3)	man
<b>Stibasoma chionostigma</b> (1,2)	horse
<b>Stibasoma flaviventre</b> (3)	man
<b>Stibasoma fulvohirtum</b> (3)	man
<b>Stibasoma panamensis</b> (3)	man
<b>Cryptotylus unicolor</b> (1,2)	cattle, horse
<b>Cryptotylus chloroticus</b> (1,2)	horse, cattle
<b>Philipotabanus (P.) ebrius</b> (1,3)	horse, man
<b>Philipotabanus (P.) elviae</b> (3)	man
<b>Philipotabanus (P.) grassator</b> (3)	man
<b>Philipotabanus (P.) magnificus</b> (1,3)	man, sloth
<b>Philipotabanus (P.) medius</b> (3)	man
<b>Philipotabanus (P.) nigrinubilus</b> (3)	man
<b>Philipotabanus (P.)</b>	
<b>pallidetinctus</b> (2,3)	man, horse
<b>Philipotabanus (P.)</b>	
<b>pterographicus</b> (1,2)	horse
<b>Philipotabanus (Mimotabanus)</b>	
<b>inauratus</b> (3)	man
<b>Philipotabanus (M.)</b>	
<b>phalaropygus</b> (3)	man
<b>Philipotabanus (Melasmatabanus)</b>	
<b>criton</b> (2,3)	horse, man



<i>Philipotabanus</i> (M.) <i>fascipennis</i> (3)	man
<i>Stypommisa</i> <i>maruccii</i> (3)	man
<i>Leucotabanus</i> <i>canithorax</i> (3)	horse
<i>Leucotabanus</i> <i>exaestuans</i> (1,2,3)	cattle, horse
<i>Lepiselaga</i> <i>crassipes</i> (1,2,3)	man, horse
<i>Poeciloderas</i> <i>4-punctatus</i> (2)	horse
<i>Tabanus</i> <i>albocirculus</i> (2)	horse
<i>Tabanus</i> <i>bigoti</i> (3)	man
<i>Tabanus</i> <i>occidentalis</i>	
<i>dorsovittatus</i> (1,2,3)	horse, cattle
<i>Tabanus</i> <i>o. modestus</i> (1,2,3)	horse, cattle
<i>Tabanus</i> <i>stenocephalus</i> (1,2)	horse
<i>Tabanus</i> <i>colombensis</i> (1,2)	horse
<i>Tabanus</i> <i>commixtus</i> (1,2)	horse
<i>Tabanus</i> <i>defilippii</i> (1,3)	horse, man
<i>Tabanus</i> <i>enanus</i> (2)	horse
<i>Tabanus</i> <i>erebus</i> (1,3)	horse, tapir, man
<i>Tabanus</i> <i>importunus</i> (1,2)	horse, cattle
<i>Tabanus</i> <i>lacajaensis</i> (3)	man
<i>Tabanus</i> <i>macquarti</i> (3)	man
<i>Tabanus</i> <i>nebulosus</i> (1,2)	horse, cattle
<i>Tabanus</i> <i>nereus</i> (2)	horse
<i>Tabanus</i> <i>nondescriptus</i> (2,3)	horse, man
<i>Tabanus</i> <i>oculus</i> (3)	mule
<i>Tabanus</i> <i>platycerus</i> (2)	horse
<i>Tabanus</i> <i>polyphemus</i> (3)	man
<i>Tabanus</i> <i>praeteritus</i> (1,2)	horse
<i>Tabanus</i> <i>pseudoculus</i> (1,2)	cattle, horses
<i>Tabanus</i> <i>punctipleura</i> (1)	horse
<i>Tabanus</i> <i>pungens</i> (2)	horse
<i>Tabanus</i> <i>rhizophorae</i> (3)	man
<i>Tabanus</i> <i>surifer</i> (1,3)	man
<i>Tabanus</i> <i>vittiger</i>	
<i>guatemalanus</i> (2)	horse
<i>Tabanus</i> <i>unistriatus</i> (3)	man
<i>Tabanus</i> <i>unipunctatus</i> (1,2)	mule, man
<i>Tabanus</i> <i>xenorhynchus</i> (3)	man

### SEASONAL DISTRIBUTION

Although information as to the seasonal distribution as reflected in the collections made in Panama is given under each species, it may be of interest to present this information in a more accessible form. Below are listed by months all species for which data on 20 or more specimens are available, 89 species in all. The remaining 61 species are each represented by less than 20 specimens.

As can be seen below, the conclusions expressed previously (Fairchild 1942) in a limited study of Tabanids taken during a year's collecting at a single locality, are in general confirmed. That is, the species fall roughly into 3 groups: those with a short flight season of about 3 months, those flying only in the rainy or dry seasons, and those on the wing throughout the year. There is a limited correlation between the type of flight season and taxonomic position. Thus all species of *Esenbeckia* have relatively short flight seasons, as does



**Pityocera** and most species of **Fidena**, while of 3 species of **Scione**, 2 fly throughout the year. All the species of **Chrysops** seem to be on the wing at all seasons. Diachlorini have all types of flight season, while most Tabanini fly for extended periods. The data are not to be trusted in all cases, as long series of some species may have been collected at a certain locality, but the locality only visited once for a short period. In general, more collecting was done in the months from May through August, least in October through December.

Since a number of the names used in my earlier publication on seasonal distribution (Fairchild 1942) have been changed for various reasons, I give here the current equivalents for those that are different for ease of comparison.

Fairchild 1942 Names	Present Usage
<b>Esenbeckia illota</b>	<b>Esenbeckia osornoi osornoi</b>
<b>Esenbeckia</b> sp.	<b>Esenbeckia ecuadorensis chagresensis</b>
<b>Dichelacera analis</b>	<b>Dichelacera fasciata</b>
<b>Psalidia fulminea</b>	<b>Catachlorops (Psalidia) fulminea</b> var. <b>ocellata</b>
<b>Cryptotylus limonus</b>	<b>Cryptotylus chloroticus</b>
<b>Cryptotylus luteoflavus</b>	<b>Phaeotabanus longiappendiculatus</b>
<b>Leucotabanus leucaspis</b>	<b>Leucotabanus exaestuans</b>
<b>Stenotabanus plenus</b>	<b>Philipotabanus (Mimotabanus) plenus</b>
<b>Tabanus (Phaeotabanus) medius</b>	<b>Philipotabanus pallidetinctus</b>
<b>T. (Hybomitra) quadripunctatus</b>	<b>Poeciloderas quadripunctatus</b>
<b>T. (Neotabanus) lineola</b> var. <b>carneus</b>	<b>T. occidentalis</b> var. <b>dorsovittatus</b>
<b>T. (N.) lineola</b> var. <b>stenocephalus</b>	<b>T. stenocephalus</b>
<b>T. (N.) maya</b>	<b>T. commixtus</b>
<b>T. (N.) angustivitta</b>	<b>T. pungens</b>
<b>T. (N.) amplifrons</b>	<b>T. colombensis</b>
<b>T. (N.) fumatipennis</b>	<b>T. platycerus</b>
<b>T. (Tabanus) ferrifer</b>	<b>T. nebulosus</b>

Seasonal distribution of Panama Tabanidae. Approximate number of specimens examined for these data follows the scientific name.

MONTH	No.	J	F	M	A	M	J	J	A	S	O	N	D
PANGONINAE													
<b>Esenbeckia</b>													
translucens	51					X	X	X	X	X			
prasiniventris	511	X	X	X									X
osornoi	105	X	X	X									
chagresensis	87						X	X	X				
<b>Pityocera</b>													
festae	64							X	X	X	X		



MONTH	No.	J	F	M	A	M	J	J	A	S	O	N	D
<b>Scione</b>													
maculipennis	50	X	X	X	X		X	X	X	X	X	X	X
costaricana	20	X							X	X			X
rufescens	50				X	X	X	X	X	X			
<b>Fidena</b>													
auribarba	50									X	X	X	
flavipennis	20			X	X	X	X	X	X	X	X		
rhinophora	20			X	X	X	X	X	X	X			
schildi	30						X	X	X	X			
trapidoi	50					X	X	X					
<b>CHRYSOPSINAE</b>													
<b>Chrysops</b>													
alleni	50		X		X	X				X			
auroguttatus	50	X	X	X	X	X	X	X	X	X	X		
calogaster	21	X				X	X	X	X	X	X	X	X
melaenus	51	X	X	X	X	X	X	X	X	X		X	X
mexicanus	20	X	X			X	X	X	X	X			X
nexusus	20	X		X		X	X	X	X	X			
scalaratus	20	X	X	X	X	X			X				
soror	20	X	X	X		X	X	X	X		X	X	X
variegatus	52	X	X		X	X	X	X	X	X	X	X	X
<b>DIACHLORINI</b>													
<b>Dasychela</b>													
badia	50	X	X	X									
<b>Stibasoma</b>													
apicimacula	30					X	X	X	X	X			
fulvohirtum	100		X	X		X	X	X	X	X		X	X
panamense	30	X	X			X		X	X	X	X		X
<b>Cryptotylus</b>													
unicolor	328	X	X	X	X	X	X	X	X	X	X	X	X
chloroticus	455					X	X	X	X				
<b>Catachlorops</b>													
fulminea	20					X	X	X	X				
f. ocellata	52	X		X	X	X	X	X	X	X	X	X	
umbratus	30	X	X	X									X
<b>Dichelacera</b>													
crocata	30				X	X	X	X		X			X
fasciata	866					X	X	X	X	X	X	X	
marginata	101	X				X	X	X	X	X	X		
regina	100		X	X	X	X	X	X	X	X		X	X
rex	30					X	X	X	X	X			
scapularis	100					X	X	X	X	X	X	X	X



MONTH	No.	J	F	M	A	M	J	J	A	S	O	N	D
<i>submarginata</i>	100			X	X	X	X	X	X	X			
<i>subcallosa</i>	39				X	X	X		X	X			
<i>Himantostylus intermedius</i>	60							X					
<i>Lepiselaga crassipes</i>	193	X	X	X	X	X	X	X	X	X	X	X	X
<i>Diachlorus curvipes</i>	101	X	X	X	X	X	X	X	X	X	X	X	X
<i>jobbinsi</i>	100	X	X	X	X	X	X	X	X	X	X	X	X
<i>Chlorotabanus inanis</i>	236	X	X	X		X	X	X	X	X		X	X
<i>mexicanus</i>	321	X	X	X	X	X	X	X	X	X		X	X
<i>Phaeotabanus longiappendiculatus</i>	401	X	X	X	X								X
<i>Stenotabanus incipiens</i>	20	X		X				X					X
<i>minusculus</i>	30	X	X	X	X								
<i>changuinolae</i>	20	X	X	X	X	X							
<i>Leucotabanus exaestuans</i>	462	X	X	X	X	X	X	X	X	X	X	X	X
<i>flavinotum</i>	33			X	X	X	X	X					
<i>Stypommisa captiroptera</i>	20	X				X	X	X	X				
<i>jaculator</i>	50			X	X	X							
<i>lerida</i>	50			X	X	X			X	X			
<i>maruccii</i>	50					X	X	X	X	X		X	X
<i>pequeniensis</i>	100					X	X	X	X	X			
<i>Philipotabanus chrysothrix</i>	30			X	X	X							
<i>ebrius</i>	50			X	X	X	X		X	X			
<i>magnificus</i>	1000				X	X	X	X	X	X			
<i>medius</i>	20				X	X			X			X	
<i>nigrinubilis</i>	50				X	X	X	X	X	X	X		
<i>pallidetinctus</i>	126				X	X	X	X	X	X			
<i>pterographicus</i>	30	X									X	X	X
<i>Poeciloderas quadripunctatus</i>	29		X	X	X	X			X	X		X	



MONTH	No.	J	F	M	A	M	J	J	A	S	O	N	D
<b>Tabanus</b>													
<b>albocirculus</b>	1030	X	X	X	X	X	X	X	X	X	X	X	X
<b>bigoti</b>	32				X	X	X	X					
<b>colombensis</b>	50		X	X	X	X	X	X	X	X			
<b>commixtus</b>	1491	X	X	X	X	X	X	X	X	X	X	X	X
<b>defilippii</b>	50			X	X	X	X	X	X	X			
<b>enanus</b>	100	X	X	X	X								
<b>erebus</b>	200				X	X	X	X	X	X			X
<b>importunus</b>	225	X		X	X	X		X	X	X	X	X	
<b>lacaiaensis</b>	20			X	X	X					X		
<b>nebulosus</b>	149	X	X	X	X	X	X	X	X	X	X	X	X
<b>nereus</b>	100					X	X	X	X	X	X	X	X
<b>occidentalis</b>													
<b>var. dorsovittatus</b>	100+	X	X	X	X	X	X	X	X	X	X	X	X
<b>occidentalis</b>													
<b>var. modestus</b>	100+	X	X	X	X	X	X	X	X	X	X	X	X
<b>nondescriptus</b>	100+	X			X		X		X			X	X
<b>platycerus</b>	30				X	X	X	X	X		X		
<b>praepilatus</b>	29	X	X		X	X	X		X				
<b>praeteritus</b>													
<b>ssp adiaxolus</b>	50	X	X	X	X	X	X		X	X		X	X
<b>pseudoculus</b>	208	X	X	X	X	X	X	X	X	X	X	X	X
<b>punctipleura</b>	20				X	X	X	X	X	X	X	X	X
<b>pungens</b>	959	X	X	X	X	X						X	
<b>stenocephalus</b>	100+	X	X	X	X	X	X	X	X	X	X	X	X
<b>surifer</b>	100+	X	X	X	X	X	X	X	X	X	X	X	X
<b>unipunctatus</b>	100+					X	X	X	X	X	X	X	
<b>unistriatus</b>	1500	X	X	X	X	X	X	X	X	X	X	X	X
<b>vittiger</b>													
<b>ssp guatemalensis</b>	250	X		X	X	X	X	X		X	X	X	

## EXPLANATION OF TERMS

Since the terms used by various taxonomists for structures mentioned frequently in descriptions are far from uniform, it may be useful to mention those used here. Some of the more important of these structures are illustrated in figure 1, p. 135.

**Frons.** The area between the eyes in female tabanids, lying above the subcallus and below the vertex. The frontal index is the vertical length of the frons divided by its width at the base, below the callus.

The frontal callus is a bare and often swollen area at the base of the frons, of various shapes, sometimes extended above into a ridge, which may form a separate or connected median callus.

The eyes may be bare or pilose, bare when no short hairs are visible under 5x magnification, pilose when such hairs are obvious under low magnification. In males a variable amount of the eye area may consist of more or less enlarged facets. When obvious differences in size are apparent, the facets are said to be well differentiated. Often these enlarged facets form a clearly defined patch in the upper part of the eye with the line of demarcation between large and small facets sharp; they are then said to be well demarcated. Eye color and pattern



fades shortly after death, but at least the pattern may usually be revived in a moist chamber or by the use of various techniques.

Vertex. The top of the head, often bearing a tubercle or bare area, frequently with 3 ocelli or vestiges thereof.

Subcallus. The area, sometimes swollen or bare, lying below the frons, and into the lower margin of which the antennae are inserted.

Frontoclypeus. The median area below the antennae. Its lower margin is next to the proboscis. It, plus the anterior parts of the genae, are often spoken of as the face.

Genae. The lateral areas below the eyes, bearing the beard.

Tentorial pits. More or less conical invaginations of the exoskeleton on each side of the frontoclypeus.

The antennae are three-segmented, the first or basal segment is the scape, the second the pedicel, and the third or terminal segment, is composed of no more than 8 annuli, the basal 4 or more of which may be fused into a basal plate, leaving a terminal style or flagellum of 2 or more annuli. The basal plate may have a dorsal angle, tooth, or spine of variable length.

The proboscis is composed of paired slender mandibles and maxillae, and unpaired labrum and hypopharynx, all more or less enclosed in a trough-like labium bearing paired labella at its distal end. Normally the last two structures are the only visible parts.

The palpi lie on either side of the proboscis and are two-segmented. The terminal segment is the largest and most prominent and is the one whose condition is usually referred to in descriptions.

The mesonotum (scutum) is the dorsal surface of the thorax, the scutellum a posterior dorsal rounded or broadly triangular sclerite slightly overlapping the abdomen. On each side are a pair of notopleural lobes at about the middle of the mesonotum. The pleura are the lateral areas of the thorax.

The abdomen is composed of 9 or 10 segments, but only the first 6 or 7 are normally visible, so that "last segment" generally refers to last visible segment on a living or undissected fly. Tergites and sternites are the dorsal and ventral surfaces of the abdominal segments.

The wing venation is very constant, but veins and cells are often referred to in describing wing patterns. I prefer the terminology used by Curran (1934) rather than the, to me, awkward terminology of the Comstock-Needham system and its various modifications, especially in regard to the cells. The fork, or fork of third vein is the junction of R4 and R5 of the Comstock-Needham system, often bearing a proximal stub or appendix. The first posterior cell (5th R) may be open, narrowed or coarctate towards the margin, or closed, sometimes some distance from the wing margin, when it is said to be petiolate. The crossband in descriptions of species of Chrysops is a dark band of variable extent extending from the costa towards or to the hind margin in the middle of the wing. The apical spot is a dark area of very variable extent distal to the cross band and always including at least part of the marginal cell. It is separated from the crossband, when extensive, by the hyaline crescent.

The basicosta is a small scale-like sclerite overlying the base of the costal vein. It is said to be bare when it lacks setae similar to those on adjoining costa, although fine pubescence is always present.

The vestiture of the body and legs consists of pollinosity, a fine colored powder-like substance, and pilosity or short or long, variously colored hairs, which are slender, sometimes ligulate, or strap-shaped and recumbent or erect. Pruinosity refers to an appearance of the surface which changes its color depending on the incidence of the light.



The legs show few outstanding characters, except for the presence or absence of paired apical spurs on the hind tibiae. The tibiae are sometimes swollen or incrassate, and the hind pair may bear long hairs in a row, the hind tibial fringe.

The colors of Tabanids are a combination of that of the vestiture and the integument, which should be described separately, but seldom are. The pattern of stripes, spots, etc. can be variously described, but in this work stripes are to be understood as being parallel to the long axis of the body, bands as being transverse or perpendicular to the long axis.

The above terminology is that traditionally used in taxonomic publications on Tabanidae and that used by me in previous publications. It differs in a few respects from that used in McAlpine et. al. (1981), but is retained here to maintain continuity with the previous work on the Panama fauna. The modern terms, where different, are inserted above in parentheses.

#### GLOSSARY OF GENERAL TERMS LIKELY TO BE FOUND IN KEYS

apical - at or towards the tip or outer end of a part.

banded - markings at right angles to long axis of body or structure.

basal - opposite of apical.

bicolored - of 2 contrasting colors, as yellow and black.

calli - plural of callus.

callosity, callus - a generally bare and shiny protuberance.

concolorous - of the same color as an adjoining part.

contiguous - in contact; touching each other.

diffuse - not clearly defined; with fuzzy or indefinite margins.

discrete - clearly defined; opposite of diffuse.

distal, distally - the end or direction away from the main body; opposite of proximal.

dorsolateral - between the mid-line and the side margin on the upper surface.

flavidus - light yellow or light yellowish brown.

fulvus or fulvous - dark yellow or dark yellowish brown.

fuscus or fuscous - blackish.

hyaline - transparent; like glass or water; often modified by such words as yellowish, smoky, grayish, etc.

inflated - swollen, as if blown up like a balloon or bubble.

infuscated - blackened or darkened.

integumental - having to do with the basal integument rather than the surface pollinosity or pilosity.

petiolate - stalked; see under wing venation in explanation of terms.

pilose - covered with pile, or very short erect hairs, like velvet or a non-shag carpet.

protuberant - sticking out, as a nose on a face.

proximal - opposite of distal.

pubescence - soft, short, reclining hairs.

setose - covered with longer hairs or bristles.

striped - markings parallel to long axis of body or structure.

tubercle - a small discrete wart-like protuberance.

unicolorous - of one color only.

vestiges - remains of a structure which no longer functions, as vestiges of ocelli.



## REFERENCES AND SYNONYMIES.

I have tried to keep the latter to a bare minimum, including only those citations necessary to clarify the name used or to refer to an illustration of the species. When possible I have included only citations referring to Panama specimens. Full synonymy as well as a fairly complete list of references to Neotropical Tabanidae will be found in the Catalogue of the Diptera of the Americas South of the United States, Fascicle 28, Family Tabanidae, Museu de Zoologia, Universidade de Sao Paulo (Fairchild 1971). I have abbreviated this title in the references under the species to "Cat. S. Amer. Dipt. Fasc. 28" in the interest of brevity. All but a very few recently described Panama species are listed in this Catalogue, with synonymy and distribution. The earlier references to the species may be found in Kroeber's 1934 Catalogue, or in various early papers by me on the Panama species, generally cited under each species, and to be found in the bibliography at the end of this work. Listing all references to each species would enormously increase the labor of preparation and greatly increase the length and cost of publication, without a concomitant increase of usefulness. The list of references at the end of this publication contains only those publications specifically cited in the text, plus a complete listing of publications referring primarily to the Panama fauna. The single most useful publication for identifying most of the Panama species is that of R. C. Wilkerson (1979), as it contains figures of many Panama species.

## Key to Subfamilies, Tribes, Genera, and Subgenera

1. Hind tibiae with 2 apical spurs. Basicosta and subcostal vein without macrotrichiae. Styles of male genitalia bifid, rounded, or pointed. Caudal ends of female spermathecal ducts simple, without cup-like expansions .....2  
Hind tibiae without apical spurs. Basicosta bare or setose, subcostal vein with at least macrotrichiae below. Styles of male genitalia truncate. Spermathecal ducts with cup-like expansions at caudal ends .....Tabaninae 7
2. Third antennal segment with 7 to 8 distinct annuli. Ninth tergite entire in both sexes .....Pangoninae 3  
Third antennal segment never with more than five distinct annuli, the basal one much the largest. Ninth tergite divided in both sexes .....  
..... Chrysopsinae 6
3. Eyes bare. Style of male genitalia bifid. Frons with ridge-like callus, which may be bare or pollinose .....Pangoniini. **Esenbeckia** (p. 22)  
Eyes pilose. Style of male genitalia simple, pointed. Frons flat, without any sort of callus .....Scionini 4
4. Third antennal segment with annuli bearing dorsal and ventral projections, bipectinate. First posterior cell petiolate, closed by a forward bending of M1 to meet R5. .... **Pityocera** (p. 34)  
Third antennal segment simple, subulate. First posterior cell open or closed, but if closed, R5 bends backward to meet M1 ..... 5



5. First and fourth posterior cells both closed..... **Scione** (p. 31)  
 Fourth posterior cell always open, first posterior closed or open .....  
 ..... **Fidena** (p. 25)
- 6.(2) First and second antennal segments elongate, both markedly longer than  
 third segment. Eye pattern of small irregular dots .....  
 ..... **Silvius (Assipala)** (p. 35)  
 Third antennal segment always as long or longer than second, usually  
 longer than either first or second segment. Eye pattern of dots and  
 bars, characteristic of the species ..... **Chrysops** (p. 36)
- 7.(1) Basicosta without strong setae or these less dense than on adjoining  
 costa. Often with one or more of the following: vestiges of ocelli;  
 sclerotized labella of proboscis; long dorsal spine on third antennal  
 segment; bare and shiny or inflated subcallus, frontoclypeus or first  
 antennal segment; inflated tibiae; pictured wings. .... Diachlorini 8  
 Basicosta with numerous strong setae, equal in size and density to those  
 on adjoining costa; or if setae sparse, then a tubercle at vertex .....  
 ..... Tabanini 26
8. Third antennal segment with a strong dorso-basal tooth or forward  
 pointing spine which often reaches to or beyond end of basal plate 9  
 Third antennal segment with at most an acute dorso-basal angle.....16
9. Eyes densely short pilose. Antennal tooth reaching beyond first annulus.  
 Proboscis at least twice length of long slender palpi, about equalling  
 head height, labella short, pollinose. Callus club-shaped, much nar-  
 rower than frons. Wings with diffuse discal dark patch .....  
 ..... **Dasychela** (p. 74)  
 Eyes bare .....10
10. Stout, generally hairy and bee-like species with usually inflated fore  
 tibiae, long hair fringes on at least hind tibiae, inflated palpi, short  
 stout antennae with dorsal tooth extending beyond first annulus, and  
 shiny sclerotized labella. ....11  
 More slender species or without the above combination of characters...12
11. Abdomen not greenish, densely hirsute. Hind tibial fringe long; at least  
 fore tibiae inflated ..... **Stibasoma** (p. 75)  
 Abdomen green or greenish, sparsely clothed with hairs. Hind tibial  
 fringe moderate; all tibiae slender ..... **St. (Rhabdotylus)** (p. 75)
12. Frontal callus reduced to a small ill-defined median bare patch or club-  
 shaped mark. Palpi inflated basally. Antennal tooth short, not  
 reaching end of basal plate. Pale unicolorous stout yellow or orange  
 species with greenish body color and unmarked wings. ....  
 ..... **Cryptotylus** (p. 81)  
 Frontal callus well defined. Antennal tooth longer, slender, acute.  
 Palpi slender. Wings with dark markings .....13



13. Stout, wholly black shiny species. Wing with a black crossband but discal cell with a round clear area. Dorsal antennal tooth long and acute. Vestiges of 3 ocelli at vertex. Labella of proboscis not or weakly sclerotized ..... **Dicladocera** (p. 75)  
 Not black and shiny, but if so wings without clear spot in discal cell. Antennal tooth variable ..... 14
14. Frontal callus slender, ridge-like, narrower than frons. Labella largely shiny sclerotized. Eyes unicolorous bright green in life, rarely bicolored or with faint median line. Mesonotum unicolorous or weakly striped, not transversely banded ..... **Catachlorops (Psalidia)** (p. 70)  
 Frontal callus as wide as frons. Eyes banded or unicolorous blackish in life. Mesonotum often transversely banded ..... 15
15. Slender black species, the wings with base and a broad discal band black, leaving area around ends of basal cells and apex beyond fork hyaline. Fore tibiae bicolored, mid and hind pair wholly black pilose. Fourth tergite with prominent white pilose dorsal triangle .....  
 ..... **Dichelacera (Desmatochelacera)** (p. 69)  
 Not entirely black, but if so then wing pattern not as above and all tibiae extensively white. Abdomen and mesonotum usually transversely banded, wing pattern a diagonal band, sometimes faint .....  
 ..... 16
16. Mesonotum dark with 2 short pale stripes anteriorly and sides and notopleural lobes yellow. Wings yellowish hyaline, the outer 3rd beyond fork faintly smoky. Subcallus with a median bare patch .....  
 ..... **Dichelacera (Idiochelacera)** (p. 69)  
 Mesonotum without longitudinal stripes, usually with at least a pale pilose transverse prescutellar band. Wings various. Subcallus completely pollinose ..... **Dichelacera (Dichelacera)** (p. 61)
- 17.(8) Subcallus, and usually first antennal segment, greatly inflated and shiny. Third antennal segment very long and slender with an obtuse dorso-basal angle. Tibiae slender or slightly incrassate. Wings black or partly so, the extreme apex always sharply hyaline, vein R2+3 bent sharply forward. Palpi moderately slender, pollinose. Frontoclypeus pollinose ..... **Bolbodimyia** (p. 56)  
 Without the above combination of characters..... 18
18. Tibiae, especially first two pairs, greatly inflated. Subcallus, frontoclypeus and genae bare and shiny. Palpi shiny and flattened. Wings basally black at least to ends of basal cells. Labella unsclerotized .....  
 ..... 19  
 Tibiae not or but slightly incrassate, and without the above combination of characters ..... 21
19. Large shiny bluish black species with basal black of wings filling half discal cell. Basal plate of third antennal segment broad and flat, over 3 times as long as style, its dorsal angle obtuse and at middle of plate ..... **Selasoma** (p. 58)  
 Small species with slender antennal plate, its obscure dorsal angle near base. Style proportionally longer ..... 20



20. Wings black only to ends of basal cells, the distal margin of the black area vertical from costa to tip of anal cell. Abdomen bare and shiny, violaceous ..... **Himantostylus** (p. 53)  
 Wings black to beyond end of discal cell, with a hyaline triangle in fourth (M3) and fifth (Cu1) posterior cells. Mesonotum, and often abdomen, with metallic brassy or greenish scale-like hairs .....  
 ..... **Lepiselaga** (p. 101)
- 21.(18) Mesopleura shiny or pearly pollinose, in contrast to rest of pleura. Labella unsclerotized. Fore tibiae nearly always moderately incrassate. Frontoclypeus nearly always shiny and inflated. Wings usually with dark apical patch ..... **Diachlorus** (p. 54)  
 Mesopleura not so, at least not contrasting with other pleural sclerites...  
 ..... 22
22. Frontal callus absent. Uniformly pale pilose insects with greenish integument, unbanded eyes, sclerotized labella and hyaline or spotted wings ..... **Chlorotabanus** (p. 58)  
 Frontal callus present ..... 23
23. Frontoclypeus and genae subshiny, produced, the face conical. Third antennal segment subcylindrical, without dorsal angle. Frontal callus club-shaped, flat. Wings unusually long, entirely black except for apical halves of basal cells ..... **Hemichrysops** (p. 55)  
 Frontoclypeus and genae not produced, the latter very rarely shiny. Callus and wings not as above ..... 24
24. Labella at least partly shiny sclerotized. Frons narrow, generally over 5 times as high as basal width, the callus small, narrower than frons. Eyes unicolorous, unbanded. Third antennal segment with strong dorsal angle ..... **Phaeotabanus** (p. 60)  
 Labella unsclerotized. Frons generally less than 4 times as high as basal width. Eyes usually banded. Third antennal segment with weak dorsal angle ..... 25
25. Frons excessively broad, less than twice as high as basal width. Frontal callus small, rounded, narrower than frons. Tentorial pits black and shiny within. Style of third antennal segment with annuli partly fused so that only 3 are distinguishable .....  
 ..... **Stenotabanus (Brachytabanus)** (p. 52)  
 Frons narrower, the callus as wide as frons. Tentorial pits pollinose. Style clearly 4 annulate ..... 26
26. Frontal callus usually higher than wide, and with a prolongation above widened into a more or less distinct median callus, usually surrounded by a dark contrasting hair patch. Eyes generally purple with 2 green bands ..... **Stenotabanus (Stenotabanus)** (p. 46)  
 Frontal callus usually wider than high, without median callus or contrasting hair patch. Eyes generally purple with three green bands or greenish with four dark bands. Mostly pale beach-inhabiting species  
 ..... **Stenotabanus (Aegialomyia)** (p. 50)



- 27.(7) With a well marked tubercle at vertex and often clear vestiges of ocelli.  
 Eyes bare, frons narrow, callus club-shaped or ridge-like .....28  
 Without a tubercle at vertex, though there may be a slightly raised shiny  
 or discolored spot. If a tubercle is rarely present, then eyes are  
 pilose, or frons broad, or callus rounded .....32
- 28 Ocellar vestiges nearly always present. Tibiae either all strongly bi-  
 colored or entirely black. Wings never patterned or spotted, some-  
 times tinted or costal cell yellowish, usually glass clear. Scutellum  
 and usually mesonotum with yellow or white vestiture, often con-  
 trasting with abdomen. Setae on basicosta as dense as on costa .....  
 ..... **Leucotabanus** (p. 98)  
 Ocellar vestiges evident or not. Mid and hind tibiae never prominently  
 bicolored. Wings seldom glass clear, either tinted, spotted or with  
 dark pattern. Setae on basicosta nearly always reduced in density,  
 rarely absent ..... 29
29. Wings clear, tinted, or the veins margined, or cross veins with prominent  
 clouds, often the apex more or less strongly darkened .....  
 ..... **Stypommisa** (p. 92)  
 Wings with prominent dark pattern, which may be reduced to a small  
 area below stigma, but does not consist of clouds on cross-veins or a  
 prominent apical dark patch ..... 30
30. Wings with an irregular dark pattern of variable extent which always  
 leaves clear areas surrounding all cross-veins and fork of third vein.  
 Frons narrow to very narrow, 7 to 10 times as high as basal width.  
 Palpi slender. Eyes bronze in life, unbanded. Always rather slender,  
 long winged species, the wings nearly or quite equalling body length.  
 Males with large eye facets bare or rarely short pilose .....  
 ..... **Philipotabanus (Philipotabanus)** (p. 83)  
 Wings ranging from almost wholly blackish to hyaline with a small dark  
 area below stigma, but cross-veins at end of discal cell and fork of  
 third vein not surrounded by clear fenestrae when included in dark  
 pattern ..... 31
31. Slender species with frons 7 times as high as wide or narrower, the palpi  
 and antennae slender, the proboscis considerably longer than palpi,  
 with small labella. Eyes bright green in life .....  
 ..... **Ph. (Melasmatabanus)** (p. 90)  
 Stouter species with broader frons not over 6 times as high as basal  
 width, the palpi inflated, the antennae broader, the proboscis hardly  
 longer than palpi, the labella large. Eyes green or brick red in life,  
 fading to greenish black. Males with large eye facets long pilose ..  
 ..... **Ph. (Mimotabanus)** (p. 89)
- 32.(27) A small rounded tubercle at vertex. First antennal segment enlarged,  
 cap-like, wider than third segment. Eyes of female usually pilose,  
 of male densely so. Wings with all cross-veins prominently spotted  
 and first posterior cell (5th R) closed or coarctate .....  
 ..... **Poeciloderas** (p. 102)  
 Without the above combination of characters. Never with a tubercle at  
 vertex, sclerotized labella or bare basicosta ..... **Tabanus** (p. 103)



Genus **Esenbeckia** Rondani

Rondani 1963, Arch. Zool. Modena 3: 83. Philip, 1945, Rev. Brasil. Ent., 2: 13-60, pp. 1-10, key. Wilkerson and Fairchild 1983, Journ. Nat. Hist. 17: 519-567, figs 1-18, key.

In addition to the characters in the key, species of **Esenbeckia** do not have produced conical fronto-clypeus, the palpi project at nearly a right angle to the axis of proboscis and are usually fairly long and curved. The proboscis is seldom over twice the height of the head, often less than head height, slender to quite heavy, the labella ranging from slender to broad, and either partly or wholly sclerotized. The antennae have the first two segments short, hardly longer than wide, the third of 8 annuli, the first few much wider than long, the terminal segments longer than wide, so that the whole segment tapers from a broad base to a slender and attenuated apex. The eyes are always bare and unicolorous, green, bronzy or blackish in life. The wings are clear, tinted, blackish or varicolored, and nearly always have the first posterior cell closed and a long appendix at fork of third vein. Legs are slender and relatively long. Three subgenera occur in Panama, but are not keyed separately.

Most species seem to be avidly haematophagous, and in Panama at least each has a definite and fairly short flight season. Males of but two of our 5 species are known.

Key to females of **Esenbeckia**

- 1. Proboscis thick and heavily sclerotized, the labella curved, thickened and entirely sclerotized. Thorax and abdomen blackish, the former with whitish hairs on pleura, the latter with narrow white hair fringes on all tergites and sternites .....  
.....(**Proboscoides**) **ecuadorensis** ssp. **chagresensis** (p. 23)  
Proboscis more slender, the labella not as above. Thorax and at least first two abdominal segments not black .....2
- 2. Palpi very short, hardly one fourth length of long proboscis. First three sternites yellowish-horn color, the second and third each with a pair of round sublateral brown spots, remainder of sternites dark brown .  
.....(**Ricardoa**) **subguttata** (p. 24)  
Palpi at least half length of proboscis. Abdomen unspotted beneath .....3
- 3. Proboscis less than head height, the labella broad and only partly sclerotized. Legs black. Mesonotum and scutellum clothed with orange pollinosity and hairs. Abdomen with first two segments translucent horn-colored, remainder black. Palpi broad and square tipped .....  
.....(**Esenbeckia**) **translucens** (p. 24)  
Proboscis at least head height, slender, the labella narrower. Legs brown or yellow. Abdomen not black .....4



4. Stout species. Palpi with blunt apices. Abdomen bright jade green. Thorax dark brown. Hind legs largely black haired .....  
 .....**prasiniventris** (p. 24)  
 Slender species. Palpi acutely pointed. Thorax and abdomen dull pale yellowish brown, the first two abdominal tergites paler. All legs pale haired .....**osornoi osornoi** (p. 25)

#### Subgenus **Proboscoides** Philip.

**Proboscoides** Philip, 1943, J. New York Ent. Soc., 51 (2): 111.

**Esenbeckia (Proboscoides)**, Fairchild, 1969, Arq. Zool. S. Paulo, 17(4): 201. Fairchild and Wilkerson 1981, Florida Ent. 64(1): 158-175, figs. 1-9.

This group is separated from typical **Esenbeckia** by having the labella of the proboscis lengthened, entirely sclerotized and apparently lacking pseudotracheae. Only one species occurs in Panama.

#### **Esenbeckia (Proboscoides) ecuadorensis** ssp. **chagresensis** Fairchild.

**Esenbeckia chagresensis** Fairchild, 1942, Ann. Ent. Soc. Amer. 35(2): 192-194, Pl. 1, fig. 9, female, Panama.

**Esenbeckia (Proboscoides) ecuadorensis chagresensis**: Wilkerson 1979. Céspedesia 8(31-32): 141-142. Fairchild and Wilkerson 1981, Fla. Ent. 64(1): 165.

This species appears to be rare in Panama, as only a single specimen has been taken since those included in the type series, from the Chagres river basin and from Utevey near Pacora. The additional specimen is from Morti river, Darien Prov., 29 July 1967. The subspecies seems confined to eastern Panama and N.W. Colombia. It differs from the nominate form mainly in having black hairs on mesonotum, rufous in **ecuadorensis**, and in a darker abdomen with only the first 2 tergites partly dull yellowish, the first 3 nearly wholly yellow in **ecuadorensis**. All Panama records are from June, July or August.

#### Subgenus **Ricardoa** Enderlein

Enderlein, 1922, Mitt. Zool. Mus. Berlin, 10(2): 340.

**Esenbeckia (Ricardoa)**: Fairchild, 1969, Arq. Zool. S. Paulo, 17(4): 201.

This group differs from **Esenbeckia** in having a very slender proboscis with small labella, and palpi usually not over half length of proboscis. Only a single species is known from Panama, the group being mainly Mexican.



***Esenbeckia (Ricardoa) subguttata* Fairchild**

***Esenbeckia subguttata*** Fairchild, 1964, J. Med. Ent. 1(2): 169, fig. 1.

Only the type specimen is known, taken at about 2000 ft. elevation at La Zumbadora, Cerro Azul, Panama Prov. in March 1959. It is easily recognized by the combination of long slender proboscis and very short palpi, hardly 1/4 length of proboscis. It is a light brown insect, the abdomen shiny reddish brown, the anterior tergites translucent, and with lateral round dark brown spots and median dark triangles on sternites 2 and 3.

***Esenbeckia (Esenbeckia) translucens* (Macquart)**

***Pangonia translucens*** Macquart, 1845, Mem. Soc. Sci. Lille (1844), p. 154, Pl. III, fig. 5.

***Esenbeckia translucens***: Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 191-192, Pl. II., fig. 15, female, full references. Fairchild, 1971, Cat. Dipt. S. Amer., 28, p. 9 synonymy. Wilkerson and Fairchild, 1983, Journ. Nat. Hist. 17: 555.

The eyes are greenish black in life. The second tergite is yellowish horn-colored and bears a black mark in the middle, from a broad inverted triangle to a thin streak, and the sides of this tergite are sometimes extensively dark; remainder of abdomen black. The antennae are black, or dark reddish brown, and the wings strongly infuscated.

The species is fairly common. Panama records are from the Atlantic coast from Bocas del Toro to San Blas, and from Cerro Azul and El Valle de Anton. It appears to prefer areas of heavy forest and high rainfall, and occurs up to about 2000 ft. elevation. It attacks man and horses eagerly, biting the latter primarily on the belly. Time of flight is from May to September, with most records in June and July.

The range is from Mexico to Brasil and eastern Peru.

***Esenbeckia (Esenbeckia) prasiniventris* (Macquart)**

***Pangonia prasiniventris*** Macquart, 1845, Mem. Soc. Sci. Lille (1844) p. 161. Pl. III, fig. 9.

***Esenbeckia prasiniventris***; Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 197-198, Pl. II, Fig. 16, female, full references. Wilkerson and Fairchild 1983 Journ. Nat. Hist. 17: 552.

The eyes are bright bluish green in life. Color of the abdomen varies from blackish green in fed specimens to pale yellowish green. Size varies from 12 to 16mm. in wing length. Beard and pleural hair varies from white or grey to orange. Males are paler, yellowish green, the eyes without enlarged facets and the palpi short and porrect.

Common to abundant. Records are mainly from the Pacific side of the isthmus, but it has been taken in Bocas del Toro and on the Atlantic side of the Canal Zone. A diurnal species with a preference for drier, open habitats at lower elevations. Nearly all Panama specimens were taken in months of Dec. to Mar., but scattered specimens in May, July, and August. Seldom taken in heavy



forest or above 2000 ft. It attacks larger domestic animals and man vigorously. The species ranges from Guatemala to Brazil. It is possible that more than one species is involved here, but evidence is not yet conclusive.

**Esenbeckia (Esenbeckia) osornoi osornoi** Fairchild

**Esenbeckia illota osornoi** Fairchild 1942, Ann. Ent. Soc. Amer., 32(2): 196, Pl. II, fig. II. Female, Panama.  
**Esenbeckia osornoi osornoi**: Wilkerson and Fairchild 1983, J. Nat. Hist. 17: 547.

The eyes are yellowish bronze in life. The male is similar in color, the upper eye facets enlarged but not sharply demarcated from the small facets. The male palpi are long, thread-like, about a third length of proboscis.

The species is fairly common. It occurs throughout the Canal Zone area, in Darien Prov., San Blas, and Chiriqui Prov. on the coast. It is a crepuscular and nocturnal species, often taken in mosquito stable traps and light traps, and appears to show a preference for localities near rivers and swamps. Time of flight is from January through March, in the height of the dry season.

The species as a whole ranges from Costa Rica to southern Brasil, the subspecies **osornoi** from Costa Rica to Colombia. I now feel that **E. illota** Will. is a Central American species with a limited range and specifically distinct from the complex of forms treated recently by Wilkerson and Fairchild as subspecies of **osornoi**.

**Genus Fidenia** Walker

Walker 1850, Ins. Saud., Dipt. 1: 8. Mackerras, 1955, Aust. J. Zool., 3(3): 487-490, full references. Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 16, synonymy. Wilkerson 1979, Cespedesia (Cali, Colombia) 8(31-32): 143-156.

Members of this large and difficult genus are easily recognized in Panama by the combination of pilose eyes, produced faces, long and slender proboscides and open cell M3. All are species of areas of high rainfall and are seldom found outside of heavy forest. Several are tree-top or forest canopy inhabitants. Males of but one regional species are known.

Key to species

- 1. Legs prominently bicolored, the femora black, the tibiae and tarsi yellow. Wings black or heavily infuscated basally to ends of basal cells .....2
- Legs not bicolored, all black or yellowish. Wings rarely heavily infuscated basally, usually evenly tinted .....3



2. Beard snow-white. Sides of mesonotum with a stripe of white hairs from before suture to posterior margin. Abdomen shiny black, with small tufts of silver-white hairs in middle of tergites 2 to 5, and at sides of tergites 2, 5, and 6. Sternites 2 to 4 with white lateral hair tufts; 2 sometimes with white hind marginal band. Face partially denuded and shiny ..... **eriomeroïdes** (p. 27)  
 Beard black or dark brown. Mesonotum without contrasting pale hairs. Abdomen shiny black or deep brown with segments 4 or 5 to 7 clothed with pale straw yellow, rufous orange, brown or black hairs. Tergite 2 with a patch of white hairs at sides, and sternites 2 to 4 with small lateral white hair tufts. Rarely tergites 3 and 4 may have small median white hair tufts ..... **rhinophora** (p. 29)
3. Legs pale yellowish brown. Beard, pleura and venter of abdomen pale yellowish pilose, contrasting with dark dorsal surfaces .....  
 ..... **auribarba** (p. 27)  
 Legs dark brown to black. At least pleura dark pilose..... 4
4. Beard brown to black. Abdomen largely black pilose..... 5  
 Beard white. Abdomen extensively golden pilose.....6
5. Large species, generally over 18 mm. in wing length. Frons narrow, over 4.5 times as high as wide, convergent below. Antennae brownish black. Face conically produced, brown, wholly grayish pollinose. Wings uniformly deep yellowish brown tinted. Abdomen dark brown to black, shiny, sparsely black pilose, with tufts of white hairs at sides of tergites 2, 5 and 6 ..... **flavipennis** (p. 28)  
 Small species, wing length generally less than 12 mm. Frons broader, less than 3 times as high as wide, parallel sided. Antennae bright yellow. Face less produced, yellow, with extensive bare patches laterally. Wings smoky hyaline, the costal cell blackish and end of first basal cell darkened. Abdomen black, the second segment sparsely white haired above and below, forming a more or less distinct hind marginal band widened at sides above. Tergites 5-7 sparsely white haired and often with median white triangles on tergites 3 and 4 ..... **schildi** (p. 30)
6. Face relatively short, shorter than frons and subcallus, largely shiny. Antennae short and unusually broad, the basal annuli markedly wider than long. Thorax black, generally with prominent white hair tufts on each side of scutellum, rarely reduced to a few white hairs mixed with black. Abdomen largely bright golden pilose, but with first tergite black pilose, second with golden hairs forming a large median triangle and lateral patches, third with only dorsolateral anterior black patches, remainder wholly golden pilose. Wings yellowish tinted, the basal cells and costal cell darker; first posterior cell coarctate, rarely closed ..... **trapidoi** (p. 30)  
 Face relatively long, as long or longer than frons and subcallus; gray pollinose above, shiny at sides. Antennae long and slender, the basal annuli at least as long as wide. Thorax without white hair tufts be-



side scutellum. Abdomen bright golden pilose from third to last segments only, with but a small patch of yellow hairs on posterior lateral borders of second tergite. Wings evenly brownish yellow tinted, the first posterior cell closed and petiolate .. **howardi** (p. 28)

### **Fidena auribarba** (Enderlein)

**Melpia auribarba** Enderlein, 1925, Mitt. Zool. Mus. Berlin, 11 (2): 276, female, Colombia.

**Melpia auribarba** var. **albibarba** Enderlein, 1925, Mitt. Zool. Mus. Berlin, 11(2): 276, female, Colombia.

**Fidena auribarba** and var. **albibarba**: Fairchild, 1958, Ann. Ent. Soc. Amer., 51(6): 528-529, full references. 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 18. Wilkerson 1979, Cespedesia 8(31-32): 145-146.

**Melpia columbiensis** Kroeber, 1930, Mitt. Zool. Mus. Hamburg, 44: 177, female, Colombia.

**Fidena columbiensis** Kroeber, 1934, Rev. Ent., 4(2): 247. Fairchild, 1951, Ann. Ent. Soc. Amer., 44(3): 442, Panama, full references.

The face is conically produced, mostly brown pollinose, but with a shiny apex and subshiny lateral stripes. Antennae nearly black and quite long and slender, much longer than palpi. Beard cream colored, the pleura more yellowish. Legs yellowish brown. Wings uniformly dilute yellowish brown, first posterior cell coarctate, rarely closed at margin, appendix short, usually absent. Abdomen black pilose above, with small median white hair tufts on tergites 2 to 5, rarely vestiges on 1 and 6. Extreme sides of all tergites, and whole venter pale creamy white pilose.

All Panama material has come from the Atlantic side of the Isthmus or from elevations above 2000 ft. Records are from Bocas del Toro, Chiriqui, and Colon Provinces. The species attacks man readily and has been taken in tree top collections as well as at ground level. All specimens seen have been taken in September, October or November.

I have studied the types of **auribarba** and var. **albibarba** on loan from Berlin Museum through the courtesy of Dr. H. Schumann. They are indistinguishable except for the color of the vestiture of beard and pleura, rich yellow orange in **auribarba**, creamy white in var. **albibarba**. The latter appears to be the normal form in Panama. The types and other Colombian specimens from Rio Raposo, near Buenaventura, 13 March 1963, V. Lee coll. and Rio Yurumanqui in Paris Museum are larger than most Panama specimens and with more produced faces. The types of **F. columbiensis** in British Museum, were probably from the Choco region of Colombia, next to Panama, and agree closely with Panama material. Use of the name **albibarba** is precluded by another **Fidena albibarba** (Enderlein), 1925, p. 293, which, though later, takes priority over a variety, which has no standing under the International Rules.

### **Fidena eriomeroides** (Lutz)

**Epipsila eriomeroides** Lutz, 1909, Zool. Jahrb. Suppl. 10, H. 4, p. 649, fig. 27, S. Paulo, Brasil. Fairchild, 1961, Mem. Inst. Osw. Cruz, 59(2): 217, Pl. 1, fig. 6.



**Fidena eriomeroides:** Fairchild, 1971, Cat. S. Amer. Dipt., Facs. 28, p. 19, synonymy. Wilkerson, 1979, Cespedia 8(31-32): 147-148.

This species is easily separated from **rhinophora**, the only other regional species with bicolored legs, by the white lateral hair stripes on mesonotum, usually prominent abdominal white triangles, and lack of contrasting pale dense hairs on posterior segments of abdomen.

Records from Panama are as follows: Rio Mandinga, San Blas, 16, 17 and 19 May 1957, in tree tops, P. Galindo coll. 4 females; La Zumbadora, Cerro Azul, Panama Prov., 12 June 1959, 1 female; Rio Paya Yellow Fever Station, Rio Tuira, Dairan Prov., 2 July 1958, 1 female; Rio Tuira Y. F. Sta., Darien Prov., R.P., 20 May 1958, in Shannon trap, 1 female. All localities are below 2500 ft. in areas of heavy rainfall and dense forest. The specimens range in wing length from 11.5mm to 16 mm. The eyes are bright green in life.

I have seen the types of all the synonyms listed in 1971, as well as specimens from Brazil (Para, S. Paulo), Colombia (Valle, Antioquia, Meta), Peru (Tingo Maria), Ecuador (Napó) and Costa Rica (Puntarenas) and although some variation is evident, it is not correlated geographically.

The male was described by Wilkerson (loc. cit.) and another of this sex from Monteverde, Puntarenas, C.R. agrees with his brief description.

### **Fidena flavipennis** Kroeber

**Fidena flavipennis** Kroeber, 1931, Zool. Anz., 95(1-2): 24, fig. 8, male, Venezuela. Wilkerson, 1979, Cespedia 8(31-32): 148-149.

**Fidena isthmiae** Fairchild, 1941, Ann. Ent. Soc. Amer., 34(3): 642-643, fig. 1, female, Panama.

The species is entirely black or dark brown, with small tufts of white hairs before wing bases, on squamae, and on sides of second, fifth and sixth tergites, occasionally on second sternite as well. This applies to all Panama specimens seen, except that rarely the pre-alar white spot is faint. As pointed out by Philip (1954) and in the original description of **isthmiae**, specimens from Mexico may show more variation which Philip (1978) has decided warrants recognition at the subspecies level. In Panama the species is occasional throughout the lowlands up to 2500 ft. on both coasts, being the only species of the genus taken in the Canal Zone area. It does not seem to be restricted to areas of heavy forest and high rainfall, but has been taken in cleared areas and even in the suburbs of Panama City. Records are at hand from the provinces of Chiriqui, Bocas del Toro, Veraguas, Panama, San Blas, and Darien as well as from both coasts of the Canal Zone. Specimens have been taken in every month from March to October. It seems not to be especially attracted to man, but has been taken biting a large boa, and more recently 4 were taken biting a dead cayman (*Crocodylia*) by C.O. Myers in Darien.

### **Fidena howardi** Fairchild

**Fidena howardi** Fairchild 1941, Ann. Ent. Soc. Amer., 34(3): 640, fig. 5, female, Panama; 1953, Ann. Ent. Soc. Amer., 45(2): 262, Pl. 1, fig. 2.



This scarce species, in addition to the characters in the key, has the scutellum reddish, white hairs on squamae, and often a small white spot before wing bases, all lacking in *trapidoi*. Aside from the type material, taken at about 6000 ft. in Chiriqui Prov., I have seen but 4 additional specimens, as follows: Almirante Yellow Fever Station. Bocas del Toro Prov., 1 Aug. 1951, taken biting in camp, 1 female; Rio Changuenla, Bocas del Toro Prov., 2400 ft., 1 Sept. 1961, 1 female; Upper Rio Changuenla, Bocas del Toro Prov., 3000 ft., 15-25 Aug. 1960, R. Hartmann coll., 2 females. All these localities are in heavy rain forest, the first being also the type locality of *F. trapidoi*. The types from Chiriqui were taken in June, all others in August or September. A single specimen from Costa Rica, Paul Serre coll. 1922 is in the Paris Museum.

### *Fidena rhinophora* (Bellardi)

*Pangonia rhinophora* Bellardi, 1858, Sagg. Ditt. Mess., 1. pp. 46-47, Tab. 1, fig. 1, female, Mexico.

*Fidena rhinophora*: Fairchild, 1953, Ann. Ent. Soc. Amer., 46(2): 262. Wilkerson 1979, Cespidesia 8(31-32): 152-153.

*Pangonia pyrausta* Osten Sacken, 1886. Biol Centr. Amer., Dipt. 1, pp. 43-44, female, Panama.

*Fidena pyrausta*: Fairchild, 1941, Ann. Ent. Soc. Amer., 34(3): 644-645, full references; 1951, Ann. Ent. Soc. Amer., 44(3): 441; 1956, Smiths. Miscell. Colls., 131(3): 26, type seen.

*Melpia auricauda* Enderlein, 1925, Mitt. Mus. Berlin, 11: 276, female, Colombia, Venezuela. Kroeber, 1930, Mitt. Zool. Mus. Hamburg, 44: 179, fig. 28.

Although not rare at suitable localities this species is rarely taken at elevations under 2000 ft. and always in areas of high rainfall. It attacks man readily, and has been taken once biting pigs at 6 A.M. Records are available from several localities in Chiriqui Prov. up to 6000 ft., in Bocas del Toro Prov., at El Valle in Coclé Prov., and in the mountains of Darien Prov. from 1900 to 4800 ft. One of the specimens from Darien also was taken in early morning. Specimens have been taken from March to September. I have seen specimens from Mexico (Oaxaca), Colombia, Venezuela, Ecuador and Peru, and others have reported it from Argentina.

There is a confusing amount of variation, both structural and tinctorial in this species, but I have been unable to correlate these variations to define clear-cut differences. A series of 15 specimens from Sta. Clara, Chiriqui average smaller than other material, with shorter, less produced faces. Four of these have the abdomen entirely black pilose, except for small tufts of white hairs at sides of tergite 2, while the remainder have the fifth to last segments rufous orange pilose. All are somewhat rubbed, but several, including one of the black pilose specimens, show vestiges of median white hair tufts on tergites 3 and/or 4. Four from Palo Santo, Chiriqui, include 2 with the fourth to last segments densely orange pilose, one with these segments pale yellowish pilose, and 1 with only the fifth to last tergites orange pilose. The first 3 have long snouts, the last shorter. One of the specimens with the fourth tergite orange pilose is homotype of *pyrausta*. The short-snouted specimen and one of the long-snouted ones bear vestiges of a median white pilose spot on tergite 3. Two specimens from Rio Cana, Bocas del Toro have the fourth to last tergites orange pilose but shorter snouts, while one from Rio Changuenla, Bocas del Toro,



has the same abdomen but a long snout. One specimen from El Volcan, Chiriqui, has the hairs on fourth to last segment pale straw colored, as do two from Tacarcuna, Darien. All three have long snouts. Three others from Tacarcuna area also have long snouts, but only fifth to last segments with pale hairs, and these deep orange rufous. One of these agrees with types of **auricauda**, except for a short appendix on fork of third vein and darker wing bases. The specimen from Peru has pale yellowish hairs on fourth to last tergites and a shorter snout, while the Ecuadorian specimen has only fifth to last segments pale yellow pilose and a short snout. In general, the larger the specimen the longer the snout.

It is possible that there are two closely similar sympatric species here, differing only in degree of prognathism, but with similar color variations. If so, statistical analysis of much longer series will be necessary to prove this. In any case, **rhinophora**, **pyrausta** and **auricauda** were all based on long-snouted specimens. **Fidena analis** Fab. and **F. basilaris** Wied. also belong to this complex, though they are both abundantly distinct, as a recent study of the types showed.

#### **Fidena schildi** (Hine)

**Erephopsis schildi** Hine, 1925, Occ. Pap. Mus. Zool. Univ. Michigan, No. 162, pp. 11-12. female, Costa Rica.

**Fidena schildi**: Fairchild, 1941, Ann. Ent. Soc. Amer., 34(3): 644, full references; 1971, Cat. S. Amer. Dipt. Fasc. 28 p. 23, synonymy. Wilkerson 1979, Cespidesia 8(31-32): 153-154, Colombia.

The characters in the key should serve to identify this species easily. It is the smallest species of the genus in Panama. The eyes in life are brilliant peacock blue. The species is fairly common in heavy forest in Bocas del Toro province, attacking man at ground level, and once taken biting pigs before dawn. Other records are: La Zumbadora, Cerro Azul, Panama Prov., 2000 ft., 13 Sept. 1956, 1 female, and Rio Tacarcuna, Darien Prov., 1900 ft., 7 and 18 July, 1963, 2 females. Both Darien specimens were taken in the early morning, between 6 and 7:30 A.M. All our records are in the months from June to September. It was known elsewhere only from Costa Rica, but I have recently seen 4 perfectly typical examples labelled Charvein, Guyane Francaise, R. Benoist 1914, in the Museum d'Histoire Naturelle, Paris, and Kroeber's types of the synonymous **nigricans** in Halle are labelled Colombia and Brasil. Wilkerson (loc. cit.) reports it from Antioquia, Colombia on the authority of C. Porter.

#### **Fidena trapidoi** Fairchild

**Fidena trapidoi** Fairchild 1953, Ann. Ent. Soc. Amer., 46(2): 260-262, Pl. 1, fig. 1, female, Panama.

Aside from the recognition characters given in the key, this species is entirely deep black, the white beard and mesonotal tufts, and bright golden vestiture of abdomen making it an unusually striking insect. The few additional specimens taken since the species was described have all come from the same locality, mostly from tree top collections, and all taken in May or June of 1951 and 1952. This locality is about 12 miles inland from Almirante, at the foot of the cordillera at less than 1000 ft. elevation, in heavy rain forest. The arboreal



habits and short flight season no doubt account for failure to collect it elsewhere. The specimens were mostly taken attacking mosquito collectors on platforms in the forest canopy, occasionally also at ground level. More recently, a specimen labelled Finca La Selva, Puerto Viejo, Costa Rica, 3-VI-75, D. R. Perry has been seen. It is the first collection of the species not from the type locality and a new record for Costa Rica.

### Genus **Scione** Walker

Walker 1850, Insect. Saundersiana, Vol. 1, P. 10.

The chief character separating this group from **Fidena** is the closed condition of cell M3. A number of species have quite hirsute faces and patterned wings, conditions not found in **Fidena**, while a bare or partly bare frontoclypeus is not known in **Scione** though frequent in **Fidena**. The center of distribution of the genus appears to be the Andean highlands, and the bulk of the species are mountain forms. A few species extend into Panama, one reaches Mexico, and others occur in the highlands of Venezuela and the Guianas and in Southern Brasil. A curious fact is the apparent absence of **Scione aurulans** Wied. in Panama, as barely subspecifically distinct forms occur from southern Mexico to Honduras and in Colombia. The nomenclature of the group is tangled, as the species are variable, numerous and separable with difficulty.

### Key to species

1. Wings particolored, yellowish and grey, all crossveins with obscure dark clouds. Thorax striped with yellow. Abdomen yellow to brown with a middorsal row of yellow pilose triangles ..... **maculipennis** (p. 31)  
Wings hyaline or tinted, not particolored and without clouds on cross veins ..... 2
2. Thorax with whitish stripes. Abdomen with tergites bearing median and lateral posterior white hair tufts. Costal and basal cells yellowish ..... **costaricana** (p. 32)  
Thorax without strongly contrasting stripes. Abdomen without contrasting pale hair tufts ..... 3
3. Palpi broadly leaf-shaped, much shorter than third antennal segment. Beard and pleura light brown, paler than mesonotum. Abdomen dark brown, black pilose, with a median row of dark red pilose triangles, venter paler, yellow pilose ..... **ablusus** (p. 34)  
Palpi sickle-shaped, subequal to third antennal segment. Beard, pleura and venter of abdomen black pilose. Abdomen with all tergites beyond first clothed with pale yellow to bright orange rufous hairs ..... **rufescens** (p. 33)

### **Scione maculipennis** (Schiner)

**Diclisia maculipennis** Schiner, 1868, Reise Novara, Zool., II, Abt. 1, Vol. B, Dipt., p. 102, Pl. II, figs. 7, 7a, female, South America.  
Fairchild, 1967, Pacific Ins., 9(2): 248, fig. 7.



**Scione maculipennis:** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 189-190, Pl. I, fig. 5, full references.

The species is variable in color and size, some specimens being quite pale and washed out, others dark and boldly marked. The prominent hair tufts on each side of the blackish scutellum may be pale straw colored, yellow, orange or largely blackish. Legs vary from pale brown to nearly black. Beard may be white, yellow or brownish. Wings may be brightly gray and yellow with prominent dark clouds, or nearly uniform grayish with but a trace of yellow and barely discernible clouds on crossveins. Profile of face and proportion of frons are fairly uniform, but shape of palpi varies from broad and leaf-like to quite slender with drawn out tip.

The species is common to abundant at suitable localities. Records are available from the provinces of Chiriqui, Bocas del Toro, Veraguas, and Darien at elevations from 1400 to 7000 ft. in areas of heavy rainfall. At higher elevations it seems to be the dominant Tabanid and attacks both man and domestic animals avidly. Specimens have been taken in every month except May.

I have seen Schiner's types, and Panama specimens agree well with his description and poor figure. Although the species may be confused with other similar species, I have seen true **maculipennis** from Venezuela, Colombia and Costa Rica.

#### **Scione costaricana** Szilady

**Scione costaricana** Szilady, 1926, Biol. Hung., 1(7): 29, female, Costa Rica. Not **Sc. costaricana**: Kroeber, 1930, Stett. Ent. Zeit., 91(2): 156.

**Scione claripennis:** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 188-189, pl. 1, fig. 3, female, Panama, full reference. Kroeber, 1930, Stett. Ent. Zeit., 91(2): 154-155, in part, Panama material only. Philip, 1954, Rev. Brasil. Ent., 2: 23, in key only. Not **Sc. claripennis** Ric. 1900.

Specimens from Panama vary much in color of vestiture. Beard may be almost white, yellow, orange or practically black, and the hair tufts on each side of scutellum show the same range of color, though the scutellum itself seems always reddish. The abdomen may be light brown to nearly black, but is always black pilose, with silvery white median hair tufts on tergites 1 to 5, on sides of tergites 2, 4, and 5, and with a more or less complete white hind marginal band on tergite 2. Venter of abdomen is brown to black with a white pilose hind marginal fringe on second sternite. Legs are unicolorous, brown to black. Frons and face are fairly uniform, but palpi vary in degree of attenuation of tips. Wings are unspotted, hyaline, more or less yellow tinted basally and along fore border.

This species is far less abundant and more restricted in range than **maculipennis**. All material seen, except the one from El Valle, Coclé Prov. listed in 1942, has come from the highlands of Chiriqui and neighboring Bocas del Toro Provinces, at elevations over 2000 feet. The species has been taken in Jan., Aug., Sept., and Dec. and probably, like **maculipennis**, flies throughout the year. So far as now known, the range is limited to Western Panama and Costa Rica.

Types of both **costaricana** Szil. and **claripennis** Ric. were in Budapest and presumably destroyed. Study of types of **strigata** End. and **brevipalpis** End. on



loan from Berlin Museum, from Ecuador and Bolivia respectively, indicates two similar but distinct species. *Brevipalpis* seems to agree best with the description of *claripennis*, with small black frontal patch, less protuberant face, and dark scutellum. It was placed as a synonym of *claripennis* by Kroeber (1930), and is certainly different from any Panama specimens. *Sc. strigata* is very similar to some Panama specimens, but differs in wider, more divergent frons, more protuberant and whitish pollinose face, and in lacking white pilose band on second tergite. A specimen from E. Peru agrees well with type of *strigata* structurally and in lacking a white band on tergite 2, but has dark brown pollinose face and yellow rather than white beard and scutellar hairs. The description of *costaricana* compares the species with *claripennis*, but says that it has dark spots around crossveins and no white fringes on hind borders of segments. In the key in the same publication, however, the wings are given as without spots. Szilady presumably had Ricardo's type before him for comparison. Kroeber (1930) keys both *claripennis* and *costaricana* as having unspotted wings, but separates them on basis of color of hair tufts at sides of scutellum, white for *claripennis*, yellow for *costaricana*, but he had no Central American material of the latter. It is also to be noted that Szilady in his key says of *costaricana*: "Sides of scutum posteriorly with white hair tufts. Abdomen with median spots of white hair." This agrees with some Panama material, but not with Kroeber's remarks. Kroeber also lists material of *claripennis* from Panama. In view of the loss of both Ricardo's and Szilady's types, certainty is probably impossible. However, the fact that the only name based on Central American material is *costaricana*, and that Panama material differs from the type of *brevipalpis* and its probable senior synonym *claripennis* and from other S. American specimens, leads me to prefer this name for Panama material. It is possible that Szilady had a weakly marked specimen of *maculipennis* as well as *costaricana* before him, which would account for the ambiguities in his key and description, as the species are quite similar except for the wings.

### *Scione rufescens* (Ricardo)

*Erephrosis rufescens* Ricardo, 1900, Ann. Mag. Nat. Hist., (7)6: 294, Peru, Bolivia. Fairchild, 1956, Smiths. Miscell. Coll., 131(3): 27. Type from Peru in Budapest presumably destroyed; paratype from Bolivia in B.M. seen.

*Rhinotriclista rufescens*: Kroeber, 1930, Stett. Ent. Zeit., 91(2): 147 with *generosa* End. as syn.

*Scione rufescens*: Kroeber, 1934, Rev. Ent., 4(2): 234. Wilkerson 1979, Céspedesia 8(31-32): 173-174.

*Rhinotriclista generosa* Enderlein, 1925, Mitt. Mus. Berlin, 11: 302, Peru. Fairchild, 1966, J. Med. Ent., 3(1): 13, fig. 20. Type studied.

*Fidena fulvosericæa* Kroeber, 1931, Zool. Anz., 95: 26, fig. 11, female, Colombia. Fairchild, 1956, Smiths. Miscell. Coll., 131(3): 17, type in B.M. seen.

*Scione aureopygia* Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 186-188, Pl. 1, fig. 4, female, Panama.

As noted by Ricardo (1900), the species is quite un-*Scione*-like in general appearance, which seems to have led to its repeated redescription. The greatly produced face lacking long hairs, long curved palpi, unmarked wings and mesonotum without prominent stripes resemble *Fidena*. The wings are peculiar in



having the membrane on both surfaces unusually glossy and finely wrinkled. There is little variation in long series from Panama, except for the colors of abdominal hairs, which range from pale straw yellow to deep rufous orange.

The species is very local, but may be abundant where found. Single specimens are at hand from three localities in the lowlands of Bocas del Toro Province, and 2 from Rio Mandinga, San Blas. There are also 2 from Porto Bello, Colon Prov., 22 Apr. 1912, Busck coll. in U.S.N.M. The species was exceedingly abundant at Tacarcuna Village, on the Rio Tacarcuna, Darien Prov., 1900 ft., an area of heavy forest and high rainfall, and three were also taken at Cerro Mali, 4800 ft. in the same area.

At the camp on Rio Tacarcuna I had the opportunity to observe the habits of this species over a three-week period. The flies were active for only a very short period just after dusk, from about 6:30 to 7:00 p.m., and to a lesser extent at the corresponding period before dawn. They were attracted to man, and to the warm part of a Shannon trap where it was heated by a lighted gasoline lantern, but did not seem much affected by the light itself. Several specimens when captured disgorged droplets of clear fluid, presumably nectar, as it was sweet to the taste. None were captured at tree platforms, nor at other times of the day. Scanty records, except for the long series from Darien, show the species to be on the wing from April to September. The species ranges from Costa Rica to Bolivia.

#### **Scione ablusus** Fairchild

**Scione ablusus** Fairchild, 1964, J. Med. Ent., 1(2): 169-170, fig. 2.

The species is known from the type, taken biting man in heavy forest at Cerro Campana, Panama Prov., 2800 ft., 2 July 1960, and another from El Valle de Anton, 21 July 1963, R. Dressler coll. A specimen det. **Sc. rufipes** Kroeber by Dr. J. Bequaert from Restrepo, Meta, Colombia agrees closely with Kroeber's brief description and appears to be the most closely related species. It differs from the present species in somewhat broader frons, red antennae, much less produced face, broader and blunter palpi, much shorter and heavier proboscis, and in lacking dark red median triangles on abdomen. The uniformly brownish tinted wings, brown unmarked mesonotum and brown abdomen (the red pilose median triangles are very inconspicuous) will, in addition to the characters in the key, easily distinguish this species in Panama.

#### Genus **Pityocera** Giglio Tos

1896, Boll. Mus. Zool. Anat. Comp. R. Univ. Torino 11(224): 3, fig 1.

Fairchild, 1969, Arq. Zool. S. Paulo 17(4): 203-204.

Easily told from all other American Tabanidae by the bipectinate antennae. The typical subgenus is monobasic and only the one species occurs in Panama.



**Pityocera (Pityocera) festae** Gig. Tos.

**Pityocera festae** Giglio Tos, 1896, Boll. Mus. Zool. Anat. Comp. R. Univ. Torino 11 (224): 3, fig. 1, female, Panama. Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 183-184, fig. 7, female, full reference. Wilkerson 1979. Cespidesia 8(31-32): 179-180.

This is a brown *Fidena*-like fly without conspicuous markings, but with lightly tinted wings, and shiny bulbous face. The first posterior cell is closed far from the margin. It is not uncommon in Panama from the Canal Zone east into Darien, but the flight season is short, from July to Sept., with most specimens taken in August. It is crepuscular and flies until after it is too dark to see, as well as before dawn, but may be on the wing in heavily shaded areas throughout the day. It is attracted to man, but does not bite readily. It has been taken in horse-baited stable traps, Shannon traps, and biting horses, and does not seem very limited in habitat requirements, as it has been taken in open country, around town, and in heavy forest. The range is from the Canal Zone area east and south to western Ecuador.

**SUBFAMILY CHRYSOPSINAE****Tribe Chrysopsini**

This tribe is the only representative of the subfamily occurring in Panama, and consists here of but 2 genera, **Silvius** (**Assipala**) and **Chrysops**. They are to be distinguished from other Panamanian tabanids by generally small size, not over 10mm in wing length, the wings with a dark pattern, the eyes in life either speckled or with dark spots and stripes, the hind tibiae with spurs, the frons broad, generally as wide or wider than high, with a frontal callus, and the terminal antennal segment of a long basal part and a 4 annulate style. The scape and pedicel are both generally long, together usually exceeding the terminal segment.

**Genus Silvius subgenus Assipala** Philip

**Assipala** Philip, 1941, Canad. Ent., 73: 4, 9, in key only; 1941, Rev. Ent. 12(3): 470-473; 1942 (1940), Rev. Chilena Hist. Nat., 44: 190-194; 1954, Rev. Brasil. Ent. 2: 58-59.

**Silvius (Assipala)**: Mackerras, 1955, Austr. J. Zool., 3(4): 616, fig. 18.

This is a small group of slender long-winged flies resembling **Chrysops** in many respects, but having the eyes irregularly speckled and with the third antennal segment very short in relation to the first two. Only a single species occurs in Panama, the group ranging thence north into southwestern U. S.



**Silvius (Assipala) tanycerus (Osten Sacken)**

**Chrysops tanycerus** Osten Sacken, 1886, Biol. Centr. Amer. Dipt., 1: 46-47, female, Costa Rica. Kroeber, 1930, Zool. Anz. 90: 73-74, figs 11-12.  
**Assipala tanycerus:** Fairchild, 1946, Ann. Ent. Soc. Amer., 39(4): 564, Panama, full references.

The species is apparently confined to extreme western Panama, as specimens have been seen only from El Volcan, Chiriqui Prov., 15 Feb. 1943, T.H.G. Aitken coll. and Potrerillos, Chiriqui Prov., 20 Jan. 1934, D.V. Brown coll. It has been recorded from Costa Rica several times. The El Volcan specimen was compared and found to agree with the types in British Museum in 1953. It is a slender brownish **Chrysops**-like fly with clouds around all crossveins and fork of third vein as well as an irregular patch below stigma and along fore border at apex. The first two antennal segments are very long, the third very short, less than half length of either of the other two. It appears to have a short flight season, since all specimens seen were taken in Jan. or Feb.

**Genus Chrysops Meigen**

Meigen 1803, Illiger's Mag. f. Insektenk., 11, p. 267. Kroeber, 1925-1926, Konowia 4(3-4): 210-256, 319-375, 5 plates. Fairchild, 1942, Proc. Ent. Soc. Washington, 44(1): 1-8, figs. 1-7. Philip, 1955, Rev. Brasil Ent. 3: 47-128, keys. Mackerras, 1955, Aust. J. Zool., 3(4): 617-620, full generic references.

The genus is characterized by having generally bare facial callosities, lengthened first two antennal segments, more or less sclerotized proboscis and labella, eyes characteristically marked in life with purple spots and bands on a bright green or golden ground, and wings usually with a dark crossband. All Panama species are small, not attaining a wing length of 9mm. The group is world-wide in distribution. In Panama, with certain exceptions, the species are local and only occasionally abundant. They attack man readily, usually about the head, and are more persistent in their efforts to bite than most local Tabanidae. Thirteen species and 1 subspecies occur in Panama, discussed below in alphabetical order.

**Key to Species**

- 1. Frontoclypeus with a median pollinose stripe. Wings with broad black crossband, first basal cell about half black basally, apical spot drop shaped. Second abdominal tergite yellow with a thick black median inverted V-shaped mark, and unconnected sublateral black spots .....  
.....**chiriquensis** (p. 40)  
Frontoclypeus entirely bare and shiny.....2
- 2. Discal cell largely hyaline, at least a central spot or streak hyaline..... 3  
Discal cell wholly infuscated.....5



3. Abdomen largely yellow, with 2 dorsolateral dark stripes from 2nd segment to 3rd, generally divided into 2 stripes on 3rd and succeeding segments. Legs and frontal and facial callosities largely yellow. Thorax yellow to brown, with yellow pollinose stripes. Wing pattern yellowish brown ..... **variegata** (p. 45)  
Abdomen with entirely black or dark brown integument. At least coxae and femora largely black, as are frontal and facial callosities ..... 4
4. Abdomen with prominent grey pollinose transverse bands on posterior margins of all tergites. Wing pattern of 2 dark bands crossing wing at ends of basal cells and beyond distal end of discal cell. Apical spot a faint narrow infuscation along fore border. Apices of femora and at least bases of tibiae yellow ..... **alleni** (p. 39)  
Abdomen entirely black, at most slight gray pollinosity at sides of tergite 2. Wing pattern fragmented, not as above. Legs brown to black, not particolored ..... **reticulatus** (p. 43)
5. Apical spot of wing a slender band or slightly widened, not extending beyond apex and encroaching into second submarginal cell (4th R.) only at extreme apex ..... 6  
Apical spot of wing extensive, filling most of wing apex and leaving but a narrow and irregular hyaline crescent or series of spots between it and crossband ..... 11
6. Fifth posterior cell (1stCu) entirely infuscated. Fourth (3rdM) usually with a small hyaline spot. Crossband broad and intensely black. Thorax black, without dorsal stripes or lateral spots. Abdomen black, sides of second tergite with small dull yellow triangles, and with small dull yellow median triangles on tergites 2 to 4 .....  
..... **leucospilus** (p. 41)  
Fifth posterior cell always with at least apex hyaline, often over half hyaline. Fourth with or without a hyaline spot ..... 7
7. Mesonotum and pleura blackish, without stripes or spots. Hyaline area in fifth posterior cell clearly extending into fourth cell, but not crossing it. Abdomen black with small dull yellow triangles laterally on second segment and median yellow triangles on tergites 2 to 5 ...  
..... **melaena** (p. 41)  
Mesonotum striped, pleura striped or spotted ..... 8
8. Abdomen with a dorsolateral series of pale dashes, forming a pair of interrupted stripes, as well as a row of pale median triangles on tergites 2 to 5. Sides of tergites 1 to 3 or 4 yellowish. Abdomen beneath yellowish, with a broad even black longitudinal stripe. Crossband of wing with outer border irregular, fading posteriorly and failing to reach hind margin in fourth posterior cell **scalaratus**(p.43)  
Abdomen without dorsolateral stripes or even ventral stripe. Outer margin of crossband straight or slightly concave, the crossband filling apex of fourth posterior cell ..... 9



9. Second tergite black with yellow median hour glass-shaped mark extending longitudinal width of tergite, the sides broadly yellow. Third to fifth tergites black with yellow hind borders, widened into narrow median triangles which usually reach anterior border of segments. Wings with broad dark crossband, without hyaline fenestra in first submarginal cell (3rdR), and with hyaline area in posterior margin of crossband confined to fifth posterior cell .....10
- Second tergite black, broadly yellow at sides, very rarely with a small median yellow spot, generally without any median mark. Tergites 3 and 4, black, with equilateral yellow triangles whose apices may reach anterior borders, tergite 5 with yellow hind border widened into a low triangle in middle. Wings with narrower crossband, the hyaline area in posterior margin of crossband large, filling all but base of fifth posterior cell and entirely crossing fourth posterior cell in middle. First submarginal cell with small hyaline streak at base .  
.....**auroguttata** (p. 39)
10. Apical spot black, extending as a clearly defined narrow costal stripe of even width to wing apex ..... **varians** var. **tardus** (p. 44)
- Apical spot dilute, ill defined, spread as a brownish shade over much of wing apex ..... **varians** ssp. **vargus** (p. 44)
- 11(5). Hind femora at least one-third basally black.....12
- Hind femora red or yellow, at most extreme apex black .....13
12. Abdomen black with second segment anteriorly narrowly, laterally broadly yellow, and with a broad yellow median triangle which rarely extends through the black to join the anterior yellow band. Tergites 3 to 5 or 6 with narrow yellow hind borders, widened into median triangles of variable size on 3 and often 4. Pleura usually with a spot of yellow pile, rarely lacking. Wings with crossband joined to cloud on fork of third vein by a dark bridge above the vein, leaving a small hyaline spot between cloud and crossband on vein .....  
.....**calogaster** (p. 40)
- Abdomen wholly black, or rarely with the pattern of **calogaster** faintly indicated in grayish pollinosity. Pleura always all black. Cloud on fork of third vein never joined by a complete bridge to crossband, rarely almost joined by spurs ..... **soror** (p. 43)
13. Cloud on fork of third vein joined to crossband by a broad spur of dark color. Midtibiae black or blackish, contrasting with pale femora. Abdomen with second tergite narrowly white to yellow anteriorly, widened to full length of segments at sides and with a generally broad, small median yellow triangle. Third and fourth tergites rarely with faint vestiges of small pale median triangles .....  
.....**nexusus** (p. 42)
- Cloud on fork of third vein unconnected with crossband. Midtibiae at most slightly brownish, not strongly contrasting with pale femora. Abdomen as above, but pale triangle on second tergite usually taller and narrower, occasionally joined to anterior yellow by a narrow median yellow stripe. Third tergite usually with a dull yellowish median streak, sometimes lacking, and fourth rarely with a minute paler streak ..... **mexicana** (p. 42)



**Chrysops alleni** Fairchild

**Chrysops alleni** Fairchild, 1939, Proc. Ent. Soc. Washington, 41(9): 257-258, fig. 1, female, male Panama; 1942, Proc. Ent. Soc. Washington, 44(1): 5. Philip, 1955, Rev. Brasil. Ent., 3: 49, 72, female, male, in key.

This is the smallest **Chrysops** in Panama, some specimens having a wing length under 5 mm. The species seems confined to mangrove swamps on the Pacific coast of the Isthmus, from Darien (Garachine) to Los Santos (Tonosi). It has been taken in February, April, May, and September, hence probably flies through the year. It may be very abundant at suitable localities and flies about the collector's head, though it seems reluctant to bite. Males have been taken resting on foliage in sunny spots along the edge of mangrove swamps, and in a mosquito light trap.

**Chrysops auroguttatus** Kroeber

**Chrysops auroguttatus** Kroeber, 1930, Zool. Anz., 90(3-4): 71-72, figs. 6-8, female, Colombia, Trinidad; Fairchild, 1946, Ann. Ent. Soc. Amer., 39(4): 565, Panama, Colombia; Philip, 1955, Rev. Brasil Ent., 3: 68, 80, 88, male, Panama. Wilkerson, Cespedesia 8(31-32): 182-184, fig. 52.

**Chrysops auroguttata** var. **pallidefemorata**: Pechuman, 1937, Rev. Ent., 7(2-3): 136, Panama. Not Kroeber 1930.

**Chrysops incisa**: Fairchild, 1942, Proc. Ent. Soc. Washington, 44(1): 3-4, fig. 3, female, Panama. Not Macquart 1846.

All Panama material seen is **auroguttatus**. The closely similar **pallidefemoratus** may be recognized by its broader frons with definitely transverse bar-like callus, and by having the second and third antennal segments considerably shorter than in **auroguttatus**. **Pallidefemoratus** usually has a yellow triangle on second tergite and usually lacks the hyaline spot in base of second submarginal cell (R2), while in **auroguttatus** these conditions are reversed. These color characters and the color of the legs are not wholly reliable, while those of structure have held in all material seen.

In Panama the species is quite abundant on the Atlantic side of the Canal Zone in the Ft. Sherman area, and has been taken at a number of other localities from San Blas to Bocas del Toro, all at low elevations on the Atlantic coast. It was not secured at our stations in the foothills of Bocas del Toro Province. It has been taken in all months from January to October and probably flies throughout the year. It attacks man persistently and enters horse-baited mosquito traps and light traps.

**Auroguttatus** has been seen from Vera Cruz, Mexico (in Coll. L. L. Pechuman), Costa Rica, Panama, Colombia and Trinidad; **pallidefemoratus** from Yucatan, British Honduras, and Trinidad, a curiously discontinuous distribution.



**Chrysops calogaster** Schiner

**Chrysops calogaster** Schiner, 1868, Reise Novara, Zool., II, Abt. 1, Vol. B. Dipt., p. 103, female, South America. Fairchild, 1942, Proc. Ent. Soc. Washington, 44(1): 7, fig. 4, female, Panama, full references. Philip, 1955, Rev. Brasil.Ent., 3: 115-116; Goodwin and Murdoch 1974, Ann. Ent. Soc. Amer., 67(1): 98 fig. 23. Wilkerson 1979, Cespedesia 8(31-32): 184, fig. 46.

This species is separable from **soror** largely on the basis of the yellow banded abdomen. About two-thirds of the available specimens from Panama have a yellow pollinose patch on the mesopleura, while in the remainder this area is dark grayish. The abdominal pattern is also quite variable. Two specimens have the yellow triangle on second tergite joining the anterior yellow band of this tergite in the middle, while in the others the triangle varies much in size. One very dark specimen has the yellow bands on tergites 3 to 5 very narrow and only evident in the middle. All have the crossband joined to the spot on furcation by a slender dark streak above the vein.

In Panama the species is uncommon but widespread. It has been taken in the lower mountains in Darien Province, on the Atlantic side of the Canal Zone, in San Blas, and in Chiriqui Province at a low elevation. All localities are in areas of relatively high rainfall. The species ranges from Costa Rica to Venezuela and Peru, though it seems nowhere common. The specimens reported by me (Fairchild 1961) from Brasil are not **calogaster**, as they have red femora and lack the dark connection between crossband and spot on furcation. Goodwin and Murdoch (1974) have described and figured the pupa, found in a small sluggish stream among dead leaves.

**Chrysops chiriquensis** Fairchild

**Chrysops chiriquensis** Fairchild, 1939, Proc. Ent. Soc. Washington, 41(9): 259-260, figs. 2-3, female, Panama, Guatemala; 1942, Proc. Ent. Soc. Washington, 44, (1): 5. Bequaert and Renjifo Salcedo, 1946, Psyche, 53(3-4): 58-59, male, Colombia. Philip, 1955, Rev. Brasil. Ent., 3: 52, 74, male, female, in key only. Wilkerson 1979, Cespedesia 8(31-32): 186-18, fig. 49.

**Chrysops subcaecutiens:** Hine, 1925, Occ. Papers. Mus. Zool. Univ. Michigan, No. 162, p. 20, Boquete, Chiriqui. (In part, not Bellardi).

This rare mountain species should be easily recognizable from the characters given in the key. It is a large, robust, hairy species, with drop-shaped apical spot and boldly marked abdomen. Philip (loc. cit.) has given the male characters in his key. In Panama the species has only been taken a few times, the holotype and Hine's specimens at Boquete (in 1939) and another female, Palo Santo, Chiriqui, 15 April 1964, both at elevations over 3000 feet. I have seen other specimens from Costa Rica, Chiapas, Mexico and Guatemala, while Bequaert and Renjifo report a male from Colombia. The first abdominal segment may be extensively pale in Mexican and Guatemalan specimens, though wholly black in both those from Panama.



**Chrysops leucospilus** Wiedemann

**Chrysops leucospilus** Wiedemann, 1828, Auss. zweifl. Ins. 1: 202, female, Brasil. Philip, 1955, Rev. Brasil. Ent., 3: 155. Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 32, synonymy. Wilkerson 1979, Cespedesia 8(31-32): 188-189, fig. 55.

The single Panama specimen of this species was taken on the Rio Tacarcuna, Darien Prov., 1900 ft., 6 July 1963, in heavy forest. It differs from all other specimens I have seen in entirely lacking any hyaline in fourth or fifth posterior cells and in having the yellow patches at sides of second tergites smaller and duller than usual. In South American material the extent of the hyaline spot in fourth posterior cell varies considerably, being very minute in some specimens from Villavicencio, Colombia, and quite large, at least half width of cell in specimens from Paraguay and southern Brasil. The record from Panama represents a large extension of range. The species was reported by Wilkerson (loc. cit.) only from the eastern side of the Andes, and his specimens had very small hyaline spots in fourth posterior cells.

**Chrysops melaenus** Hine

**Chrysops melaena** Hine, 1925, Occ. Pap. Mus. Zool. Univ. Michigan, No. 162, p. 17, female, Costa Rica, Venezuela. Fairchild, 1942, Proc. Ent. Soc. Washington, 44(1): 3, fig. 2, female, Panama, full references. Fairchild, 1953, Ann. Ent. Soc. Amer., 46(2): 259-260, male, Panama. Philip, 1955, Rev. Brasil. Ent., 3: 68, 80, in key only. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 100, fig. 24. Wilkerson, 1979, Cespedesia, 8(31-32): 189-191, fig. 48.

In addition to the characters given in the key, the species has the frontal and facial callosities largely or wholly yellow, the femora bicolored, black basally, reddish yellow apically. It is the commonest and most widespread species of the genus in Panama, occurring mainly in heavy forest, from sea-level to 3000 ft. along the Pacific coast from Darien to Chiriqui provinces. There are numerous records from the Canal Zone, a few from Colon and San Blas, but it has not been taken in the Bocas del Toro area in spite of intensive collecting. It is especially frequent at El Valle, and in forested areas in the Canal Zone. We have a single record from Coiba Island, off the Pacific coast of Veraguas Province, one of the few Tabanidae recorded from there. It attacks man readily and is taken in horse-baited stable traps. The single recorded male was taken in a light trap. We have taken it in every month save October, so that it probably flies throughout the year. The range is from Costa Rica to Venezuela. Goodwin and Murdoch (1974) described the pupae of both sexes.

It is probable that future collecting will show that **melaenus** is but a race of **C. latifasciatus** Bell. The two are separated only by the extension of the hyaline area in the fifth posterior cell into the fourth posterior cell in **melaenus**, while it is confined to the fifth posterior cell in **latifasciatus**. Occasional specimens of the latter show a small subhyaline spot in the cell. **Latifasciatus** has been seen from Nicaragua, Honduras, Guatemala and the states of Chiapas and Tabasco, Mexico. The few Costa Rican specimens seen have been **melaenus**. I have not seen the specimens from Nicaragua reported as **melaenus** by Woke (1947); my two from that country are both **latifasciatus**.



***Chrysops mexicanus* Kroeber**

***Chrysops calogaster* var. *mexicana*** Kroeber, 1925, Konowia, 4: 248, Pl. II, IV, male, female, Mexico.

***Chrysops mexicana*:** Fairchild, 1942 Proc. Ent. Soc. Washington, 44(1): 8, fig. 6, Panama, in part; 1946, Ann. Ent. Soc. Amer., 39(4): 565-566. Philip, 1955, Rev. Brasil. Ent., 3: 109-110, types seen. Wilkerson (1979, Cespadesia, 8(31-32): 191-192, fig. 53.

As suggested previously (Fairchild 1946), Panama material represents two closely similar species, separated in the key. Fig. 6 in the 1942 publication represents *mexicanus*, which averages larger and seems to have a different distribution. The bulk of our material has come from several localities in Bocas del Toro province, with lesser numbers from the mountains in Veraguas and Cocle provinces, and 2 from the eastern part of Colon province. All specimens were taken in areas of high rainfall and heavy forest, mostly between 1000 and 3000 ft. elevation. In localities where forest canopy collections were made it was only once taken in the treetops.

Aside from Panama specimens, I have seen 2 from Chiapas, Mexico in Coll. L. L. Pechuman, one of which was compared with the type by Dr. Philip, who noted that it had more yellow on abdomen than the type. It is also more yellow than Panama specimens, having the first abdominal segment extensively yellow and the triangles on third and fourth tergites large and conspicuous. Dr. Philip also compared a specimen from Almirante with Kroeber's types and noted that the hyaline crescent was wider in the Panama specimen and that it lacked the narrow dark spur along the vein from crossband to fork. Both these are variable characters. I have also seen a third female, Rio Raposo, near Buenaventura, Colombia, 25 Nov. 1963, taken at a tree platform 13 meters above ground level, V. Lee leg., which agrees closely with Panama material. It was one of 11 specimens taken at that locality (Lee et al. 1969). The species thus ranges from southern Mexico to Western Colombia, as reported by Wilkerson (1979).

***Chrysops nexosus* Fairchild**

***Chrysops nexosus*** Fairchild in Wilkerson 1979, Cespadesia 8(31-32): 192-194, fig. 45.

***Chrysops mexicana*:** Fairchild 1942, Proc. Ent. Soc. Washington, 44(1): 8, fig. 7, in part; 1946, Ann. Ent. Soc. Amer., 39(4): 565-566, in part. Not Kroeber 1925.

Holotype female, Santa Fe, Veraguas province, Panama, 9 Aug. 1950, taken at platform in forest canopy 26 feet above ground level.

Paratypes, 4 females, same locality as holotype, taken 17, 26 July 5; 10 Aug. 1950, all at ground level; 3 females, Cerro Tute, vic. Sta. Fe, Veraguas prov., 20 Mar. 1947; 1 female, Almirante, Bocas del Toro Prov., 11 July 1957, in Shannon trap at Yellow Fever Station; 1 female, Ft. Sherman, C.Z., 14 June 1947; 1 female, Rio Pequeni, Madden Lake, Colon Prov., 21 Aug. 1940; 1 female, La Victoria, Cerro Azul, 2400 ft., Panama Prov., 23 Jan. 1947; 2 females, Cerro Santa Rita, Colon Prov., 6 May 1952; 4 females, Rio Mandinga, Colon Prov., 23



Sept. 1956 and 25, 27 Jan. 1957; 2 females, Pito, San Blas, 20 June 1943. Holotype and some paratypes to be deposited in F.S.C.A.

This species is to be separated from the other Panama species by the characters given in the key. From *C. rossi* Philip and *C. fairchildi* Philip, it differs in having all femora yellow on at least basal two-thirds. From *rossi* it differs further in less infuscated basal cells, and from *fairchildi* in having yellow spots on pleura and lacking yellow hind marginal bands on any tergites.

### ***Chrysops reticulatus* Wilkerson**

***Chrysops reticulatus*** Wilkerson 1979, *Cespedesia* 8(31-32): 195-197, figs 28, J-4,5, female, Panama, Colombia.

***Chrysops soror***: Lee, Fairchild and Baretto, 1969, *Caldasia* 10(49): 445. Not Kroeber 1925.

An almost wholly black species indistinguishable from *C. soror* Kroeber except by the fragmented wing pattern, all cells in the area of the cross band with hyaline centers, whereas in the apical wing area all cells have dark central spots or streaks.

I at first thought the specimens I had seen were but aberrant specimens of *soror*, but Dr. Wilkerson studied additional Colombian material and feels that these specimens represent a distinct species. The only Panama specimen known is the holotype, taken at Rio Mandinga, San Blas, 13-V-57.

### ***Chrysops scalaratus* Bellardi**

***Chrysops scalaratus*** Bellardi, 1859, *Ditt. Mess.* Pt. 1, p. 72, Pl. 2, fig. 19, female, Mexico. Fairchild, 1946, *Ann. Ent. Soc. Amer.*, 34 (4): 564-565, Panama, full references; Philip, 1955, *Rev. Brasil. Ent.*, 3: 68, 77, M, F, in key only.

This is the largest species of the genus occurring in Panama. It is easily recognized by the irregular step-like outer margin of the crossband, which also fails to reach the hind margin of the wing in full intensity, and by the three rows of light spots on the abdomen. In Panama it has been taken on the coast of Bocas del Toro Prov. around Almirante, and at Robalo, on the Chiriqui Lagoon. It does not occur in heavy forest inland, but seems confined to the vicinity of coastal fresh water swamps. It bites man and horses and may be abundant and annoying. Our records indicate captures from January to May and in August, but it probably flies throughout the year. The range extends northward on the Atlantic coast into southern Mexico. Recent collections in Bocas del Toro Prov. included a number of males taken in U.V. light traps. This sex is similar to the female, differing chiefly in more extensively infuscated basal cells and in having sublateral dark abdominal stripes reduced to a slender dusky line.

### ***Chrysops soror* Kroeber**

***Chrysops soror*** Kroeber, 1925, *Konowia*, 4: 245, Pl. 2, female, Venezuela. Fairchild, 1942, *Proc. Ent. Soc. Washington*, 44(1): 7-8,



fig. 5, Panama, Guatemala, full references; 1946 (1947), Ann. Ent. Soc. America, 39(4): 565. Philip, 1955, Rev. Brasil. Ent., 3: 59, in key.

Easily recognized by being the only all black-bodied species in Panama, except for the aberrant *C. reticulatus* Wilk. Occasional specimens show faint grey middorsal triangles and lateral spots on second abdominal tergite.

In Panama the species occurs from Darien to Chiriqui, mostly in the mountains over 2000 ft., but also at lower elevations on the Atlantic coast. None have been taken in the Canal Zone, and in general it does not occur with *calogaster*. Dates of capture include all months but April and September.

The species ranges from Guatemala to Venezuela and Colombia. I have also seen material from British Honduras (Belize), Hells Teeth Creek, 6 Oct. 1955, Galindo and Trapido, and Honduras, Lancetilla, 23 Nov. 1953, W. Hils.

### *Chrysops varians* var. *tardus* Wiedemann

*Chrysops tardus* Wiedemann, 1828, Auss. Zweifl. Ins. 1: 577.

*Chrysops varians* var. *tardus*: Fairchild, 1971, Cat. S. Amer. Dipt., Facs 28, p. 34, synonymy. Wilkerson 1979, Cespedesia 8(31-32): 198-199, fig. 51.

The species most resembles *C. melaena* of the local fauna, differing in having a large yellow triangle on tergite 2 of the abdomen which joins the yellow base of the segment, in having all tergites with posterior borders yellow, and in lacking hyaline in 4th posterior cell of wing. It has been taken but once in Panama, at 1500 ft. on Cerro Pirre, Darien Prov., where 7 females were taken in a Shannon trap from 27 Jan. to 6 Feb., 1961. The species and its variety range south to Argentina, and it seems to be one of the commonest species of the genus throughout much of its range. Typical *C. varians* is paler, with more yellow on abdomen and often a reddish scutellum; it seems rare in the northern parts of the range of the species.

### *Chrysops varians* ssp. *vargus* n. ssp.

Differs from *variens* var. *tardus* only in the following respects. Apical spot diffuse, more dilute than crossband and fading out posteriorly so that in some specimens the whole wing apex is faintly tinged, leaving only a restricted completely hyaline stripe bordering the crossband. Yellow markings of abdomen on the average less extensive, so that median yellow triangles on tergites 3 and 4 rarely extend to anterior margins of these tergites.

Holotype female, vic. Chitaria, Turrialba-Siquirres, Limon Prov., Costa Rica, 18 Feb. 1965, R. Dressler coll. Paratypes: 2 females, same locality and collector, 22 Feb. 1965; 1 female 10 mi. N.W. Pto. Jimenez, Costa Rica, 16 Aug. 1957; 2 females 5 mi. S.W. Sta. Clara de San Carlos, Alajuela Prov., Costa Rica, 400 ft. el. 19 Feb. 64, H. E. Evans coll.; 1 female Golfito, Costa Rica, 15 Aug. 1957, Arnold Menke coll.; 1 female Almirante, Bocas del Toro Prov., Panama, 2 Oct. 1951, in Shannon trap at ground level. The name is Latin for "vagabond" in allusion to its distribution. The holotype will be deposited in F.S.C.A., 1 paratype each in collections L. L. Pechuman, C. B. Philip and G. B. F. 2 paratypes are in Los Angeles County Museum of Natural History.



This appears to be an additional case of discontinuous distribution where the range of a species is broken by the isthmian area of Panama. Typical *varians* var. *tardus* is found only in extreme eastern Panama, the present subspecies in extreme western Panama, and neighboring Costa Rica.

### ***Chrysops variegatus* (De Geer)**

***Tabanus variegata*** De Geer, 1776, Mem. pour Servir a l'Hist. des Ins., VI, p. 230, Pl.XXX, figs. 7, 8, female, Surinam.

***Chrysops variegata*:** Bequaert, 1940, Rev. Ent., 11(1-2): 276-279.  
Fairchild, 1942, Proc. Ent. Soc. Washington, 44(1): 4-5 fig. 1. Philip, 1955, Rev. Brasil. Ent., 3: 66, 85, female, male, in key.

The numerous references and synonyms of this common and widespread species are listed by Bequaert (1940).

This species is quite variable in color. The hyaline crescent may be either well marked or reduced to a diffuse paler area along outer border of crossband, only the rounded spot in first submarginal cell being distinct. The abdominal black dorsolateral stripes may be broad and intense, or narrow and faint, clearly divided into stripes on each side at third tergite, or not until fourth. Outer border of crossband may be straight, convex or slightly sinuous. Whether these variations represent separate populations, as some have thought, or only fortuitous variations, will need careful and probably statistical analysis of large numbers to clarify.

In Panama the species occurs in small numbers throughout the lowlands of the Pacific Coast and the Atlantic coast in the Canal Zone. It has not been taken in areas of heavy forest, such as at the Almirante Yellow Fever Station, or the forest stations in Darien, but seems to show a preference for low swampy terrain along rivers, and coastal mangrove swamps. It bites man and horses readily, and both sexes have been taken in mosquito light traps. Our records are from all months of the year save March, so that it probably has no definite flight season. The species ranges from southern Mexico and Cuba south through the Antilles and Central America to northern Argentina and Paraguay.

## **SUBFAMILY TABANINAE**

### **Tribe Diachlorini**

The Diachlorini are a structurally diverse group and a dominant one in the Neotropics. In addition to the characters given in the key, Diachlorini are often mimetic, resembling Hymenoptera or other families of Diptera. Their wings are often boldly patterned, ocelli or ocellar tubercles are frequently present, the antennae are frequently modified, their labella often strongly sclerotized. This plethora of structural and tinctorial specializations, combined with the retention of other characters such as ocelli and bare basicostas has led to the belief that they are the more primitive of the 2 tribes of Tabaninae occurring in the Neotropics. It has also led to the creation of many named segregates in contrast to the Tabanini. There are 59 genera and subgenera of Diachlorini in the Neotropics compared to only 5 of Tabanini. In Panama the corresponding numbers are 25 and 2.



Genus **Stenotabanus** Lutz

Lutz 1913, Brazil Medico, 27(45): 6. Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 297-298, full references.

The three subgenera as defined in the key are treated separately below. All the species of the nominate subgenus are small to moderate in size, seldom exceeding 10 mm. in wing length and generally smaller. Colors are diverse, the abdomen banded, spotted or striped, the wings generally clear, occasionally with spots on crossveins or tinted, but never with a pronounced dark pattern. The eyes are always banded, the frons usually fairly broad. Known males have the upper eye facets greatly enlarged and sharply demarcated from the small facets. All the species have short proboscides with soft, unsclerotized labella and short inflated palpi.

Subgenus **Stenotabanus** Lutz

Key to females

- 1. Femora yellow. Abdomen pale brown with a broad yellowish white stripe from base to apex. Wings slightly brown tinged. Eye purple with 4 narrow green bands .....**fulvistriatus** (p. 47)  
Femora black or brown. Abdomen without median pale stripe ..... 2
- 2. Legs entirely dark. Mesonotum with a pair of prominent dorsolateral whitish stripes and the black scutellum bordered with white. Tergites blackish, 2 to 6 with narrow pale hind borders, 1 and base of 2 bluish pruinose. Wings glass clear. Eyes purple with two narrow green bands ..... **minuscula** (p. 48)  
All tibiae basally pale ..... 3
- 3. Subcallus inflated, bare and shiny. Mesonotum sparsely, scutellum densely clothed with bright golden hairs. Abdomen with hind borders of tergites 2 to 6 banded with bright golden hairs, the band narrow on 2, broad on the remainder and broadest in the middle. Eye purple with 2 narrow green bands and the upper and lower borders greenish purple ..... **calvitus** (p. 47)  
Subcallus pollinose, or if partly bare, then abdomen black and wings deeply fumose ..... 4
- 4. Abdomen with prominent pale hind marginal bands on tergites 2 to 6. Frontal callus about as wide as high ..... 5  
Abdomen with faint hind marginal bands or none. Frontal callus clearly higher than wide ..... 6
- 5. Antennae wholly orange. Mesonotum unstriped, steel grey pollinose, with numerous greenish shining scale-like hairs. Palpi blackish, at least mainly black-haired. Eye reddish bronze with 2 green bands ..  
..... **incipiens** (p. 48)



Antennae with at least style black, basal plate usually apically dusky. Mesonotum brownish pollinose, with a pair of broad golden-haired dorsolateral stripes and scutellum prominently pale on posterior half. Palpi pale yellow, wholly pale haired. Eye purple with 2 green bands ..... **minuscula** var (p. 48).

6. Whole insect black, including palpi and venter of thorax and abdomen. Mesonotum with scattered greenish scales. Antennae wholly dark orange. Wings deeply fumose on apical half, darkest anteriorly. Eye green with 3 purple bands ..... **sordidatus** (p. 49)  
 Venter of abdomen and thorax grey pollinose and white haired, mesonotum without greenish scales, abdomen with narrow and faint pale hind-marginal bands and small median pale hair tufts on all tergites. Antennae with at least style black. Palpi pale basally, with at least some white hairs. Wings nearly glass clear, faintly and unevenly brown tinted. Eye purple with 2 very narrow green bands .....  
 ..... **obscurus** (p. 49)

#### **Stenotabanus (Stenotabanus) calviti** Fairchild

**Stenotabanus calviti** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 306-307, fig. 10, F, Panama.

This little species, only 7-8 mm. long, is easily recognizable by the combination of bare subcallus and densely golden-haired scutellum. Only 3 specimens are known, as follows: Panama City, in automobile, 10 Jan. 1942; Rio Tanganti, Camp 2, Rio Mandinga, San Blas, 24 Jan. 1957; upper Rio Pucro, Darien, in Shannon trap, 15 Mar. 1958. The last two localities are in areas of heavy forest and high rainfall. The most similar species appears to be **Stenotabanus roxannae** for which Wilkerson (1979) erected the subgenus **Stilbops**. The present species agrees quite well with **roxannae** in structure of frons, but differs in having the abdominal tergites bordered behind with pale pollinosity and golden hairs, in lacking any brown coloring in the wings, except for the stigma, and in having white pollinose and pilose genae and frontoclypeus.

#### **Stenotabanus (Stenotabanus) fulvistriatus** (Hine)

**Tabanus fulvistriatus** Hine, 1912, Ohio Naturalist, 12(7): 515, female, Mexico. Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 303, fig. 11, female, Panama; 1953, Ann. Ent. Soc. Amer., 46(2): 270, male, references and synonymy.

Easily recognizable by the broad yellowish-white abdominal stripe, this species seems to reach its southern limits in western Panama. We have records of only 4 specimens, 3 from Puerto Armuelles, Chiriqui Prov., 27 July 1929, L. H. Dunn, coll. and one taken in a railroad car at Concepcion, Chiriqui Prov., 10 Aug. 1950. The species ranges north to Mexico.

Other closely similar species occur from eastern Peru south to Brasil and Argentina, but there appears to be a large gap in distribution which includes



most of Panama and Colombia. The eyes in life are purple with 4 narrow green bands. The male has the upper facets of the eye well demarcated from the lower facets and the facets noticeably enlarged.

**Stenotabanus (Stenotabanus) incipiens** Walker

**Tabanus incipiens** Walker, 1860, Trans. Ent. Soc. London, (N.S.) 5: 275. Amazon region. Fairchild, 1956, Smiths Miscell. Coll. 131(3): 19. Type in London headless.

**Stenotabanus (Stenotabanus) incipiens:** Fairchild, 1971, Cat. S. Amer. Dipt., 28, p. 46, synonymy. Wilkerson 1979, Cespidesia 8(31-32): 212-214.

**Tabanus maculifrons** Hine, 1907, Ohio Naturalist, 8(2): 222, female, Guatemala.

**Stenotabanus maculifrons** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 304, fig. 8, female, Panama, Colombia, references. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 110 fig. 32.

This species can be separated most quickly from **minuscule** by bicolored tibiae, and from the variety by blackish palpi, wholly yellow antennae and generally black and white color. The eyes in life are reddish bronze with two green stripes. What I believe are males of this species are similar to the females, and distinguishable with difficulty from presumed males of **minuscule** and its variety. They are placed here on the combination of wholly yellow antennae, dark fore coxae and basally whitish tibiae.

**Incipiens** has been taken at several localities in the Canal Zone and nearby Panama and Colon provinces, and at Almirante, in Bocas del Toro prov., almost entirely in light traps, Shannon traps, and in buildings. Some of the collecting localities are in heavy forest, others in relatively dry and open areas, all at low elevations. The species is probably on the wing throughout the year as records are from Jan., Mar., July and Dec. The known range is from Guatemala to Trinidad and Bolivia.

Goodwin and Murdoch (1974) succeeded in rearing a single female found near an old log, and figured the pupa.

**Stenotabanus (Stenotabanus) minuscule** (Kroeber)

**Pseudacanthocera (?) minuscule** Kroeber, 1930, Zool. Anz., 90(3-4): 80-81, fig. 21, Vulcan Colima, Mexico. Fairchild, 1966, Stud. Ent., 9(1-4): 354. Type studied.

**Stenotabanus (Stenotabanus) minuscule:** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 305, fig. 7, Panama;

This species is clearly separable from **incipiens** and the variety discussed below by the wholly blackish legs, and from **incipiens** in addition by largely white palpi and striped thorax. The eye in life is dark reddish, with two green transverse bands, seemingly narrower than in **incipiens**. In Panama the species has been taken at several localities in the Canal Zone, notably a long series taken in a Malaise trap on Barro Colorado Id. by C.W. and H. E. Rettenmeyer, in nearby Panama prov., and in Darien prov. up to 1500 ft. Most of the localities are in or near forest, in areas of moderate to high rainfall. All were se-



cured in the dry season, from Jan. to Apr. in various years. Presumed males are browner and lack the mesonotal stripes. Their tibiae are all dark, fore coxae dark but with pale pollen, and antennal styles blackish. The known range is from Mexico to Panama.

What appears to be only a well marked variety of *minuscule* differs only in having all tibiae extensively white, fore coxae pale in ground color, and thorax and abdomen brown rather than black, the pale markings of thorax and abdomen yellowish. It has only been taken with *minuscule*, at the same localities and season. Since leg color is used as an important key character, *minuscule* appears twice in the key. Males of what appear to be this variety differ from *minuscule* males only in having the tibiae pale basally, and fore coxae pale in ground color. I can find no structural distinctions in either sex, and some specimens are intermediate in leg color, having reddish tibiae and black femora. The type in Munich agreed well with a specimen from Chiapas, Mexico, with wholly dark tibiae.

### ***Stenotabanus (Stenotabanus) obscurus* Kroeber**

***Stenotabanus obscurus*** Kroeber, 1930, *Encycl. Entom.*, Ser. B., II, Diptera, V p. 124, Pl. 1, figs. 21; Pl. 2, figs. 5, 35; Pl. 3, fig 51. Venezuela. Wilkerson, 1979, *Cespedesia* 8(31-32): 217-218.

***Stenotabanus (Stenotabanus) constabulorum*** Fairchild, 1942, *Ann. Ent. Soc. Amer.*, 35(3): 304-305, fig. 6, female, Panama.

Aside from the characters in the key, this species is 8-9 mm. long, largely black dorsally with scattered small metallic scales on thorax, the abdominal bands very narrow, the mid and hind tibiae very largely white, the frons about 7 times as high as wide, considerably narrowed below, the callus higher than wide and the median callus large and prominent. The vertex is extensively bare, with prominent vestiges of ocelli.

A male from Rio Tacarcuna, Darien, 19 July 63, though slightly teneral, agrees well with the female, except that the antennae are wholly yellow. The eyes are holoptic, wider than thorax, the upper area of enlarged facets well differentiated and demarcated from the small, occupying about two-thirds eye area. The upper facets are dull bronzy, the lower red with a narrow green streak. The female eye is reddish purple with two narrow green bands.

**Obscurus** has been taken rarely and at but 4 localities in Panama, on the headwaters of Madden Lake on the Rio Boqueron and Rio Pequeni, Colon Prov., at Cerro Campana, Panama Prov., and at Rio Tacarcuna, Darien Prov. All are areas of heavy forest and high rainfall. Specimens have been taken in March, May, June and July.

The species has been taken also at Palmar, Dept. Puntarenas, Costa Rica, from where it ranges south to Venezuela, and eastern Peru and Bolivia.

### ***Stenotabanus (Stenotabanus) sordidatus* Fairchild**

***Stenotabanus sordidatus*** Fairchild, 1958, *Ann. Ent. Soc. Amer.*, 51(6): 525-526, fig. 6, female, Panama. Wilkerson, 1979, *Cespedesia* 8(31-32): 218-219.



This species has the abdomen entirely black, the wings strongly blackish fumose, and all tibiae extensively white. The eye in life is green with 3 reddish purple bands. It has been taken in Bocas del Toro, Colon, Panama, San Blas, and Darien provinces, always rarely and always in heavy forest below 2000 ft. Our records are for Jan., Feb., March, May, June, and July. Perfectly fresh specimens have the subcallus thinly pollinose in the middle and at sides, not entirely bare and shiny as shown in the original description. The species has so far been taken outside Panama only in Antioquia, Colombia and at Golfito, Puntarenas Prov., Costa Rica, the latter locality being a new record for Costa Rica.

Subgenus **Aegialomyia** Philip

**Aegialomyia** Philip 1941, Canad. Ent. 73: 10, in key, **T. psammophilus** O. S. type species.  
**Stenotabanus (Aegialomyia):** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 298-299. Philip, 1958, Amer. Mus. Novit., No. 1921, pp. 104, key.

Flies of this subgenus are mostly small to medium sized insects, up to 15 mm. in length, generally with relatively broad frons and often pale or whitish in general color. The eyes are generally purple with three green bands or greenish with four dark bands. Most of the species are inhabitants of coastal environments, beaches or mangrove swamps. The main concentration is in the Caribbean area, some sixteen species being known from the West Indies and adjacent coasts from Florida to Venezuela. Some species will attempt to bite man, while others seem to show little interest in him. Five species are known from Panama.

Key to females.

- 1. Abdomen without dorsolateral pale patches, grayish brown with hind and lateral margins of all tergites whitish and a more or less complete middorsal pale stripe. Frons 2.5 to 3 times as high as basal width. Basal plate of third antennal segment as wide as long .....  
.....**changuinolae** (p. 51)  
Abdomen with dorsolateral pale patches. Basal plate frequently longer than wide .....2
- 2. Wings with definite brown clouds on crossveins and fork of third vein. Frons 3 times as high as basal width, narrowed below, the callus unusually protuberant. Palpi slender and curved, not markedly inflated basally. Eyes purple with 2 green bands .....**pompholyx** (p. 52)  
Wings without clouds. Palpi markedly inflated .....3
- 3. Frons broader, hardly twice as high as wide, parallel sided, the vertex entirely bare and shiny. Antennal style longer than plate .....  
.....**blantoni** (p. 51)  
Frons narrower, over twice as high as wide, the vertex not entirely bare .  
.....4



4. Frons about 2.2 times as high as wide. Antennal style subequal to basal plate, the latter longer than wide. Median abdominal stripe nearly parallel sided and continuous, the sublateral pale spots small and discrete ..... **littoreus** (p. 51)
- Frons about 2.8 times as high as wide. Antennal style longer than plate, the latter as wide as long. Median abdominal stripe is a series of contiguous triangles, the sublateral spots large and diffuse .....  
 ..... **paitillensis** (p. 52)

**Stenotabanus (Aegialomyia) blantoni Fairchild**

**Stenotabanus (Aegialomyia) blantoni** Fairchild, 1953, Ann. Ent. Soc. Amer., 46(2): 269, Pl. 1, fig. 5, female, Panama. Philip, 1958, Amer. Mus. Novit. No. 1921, p. 3, in key.

Only the types are so far known with certainty, taken in a mosquito light trap at Jaque, Darien prov. in July, 1952. This locality is on the Pacific coast near the Colombian border. What may be the male of this species is represented by a specimen taken in a car in Panama City 9 Apr. 1957 by my colleague Pedro Galindo. It is slightly larger than the female, the abdominal pattern like the female though paler and less distinct, but it has a long appendix on fork of third vein, longer than either **St. (A.) paitillensis** or **St. (A.) littoreus**, the most similar regional species. The eyes are holoptic, bare, the upper facets well differentiated and demarcated from the lower, occupying at least 2/3 of eye area. There is a very small tubercle sunk between eyes at vertex. The upper facets are pale tan in life, the lower bronzy with one pale green stripe.

**Stenotabanus (Aegialomyia) changuinolae Fairchild**

**Stenotabanus (Aegialomyia) changuinolae** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 300, fig. 5, female, Panama.

**Stenotabanus (Aegialomyia) ananasi** Fairchild, 1951, Ann. Ent. Soc. Amer., 44(3): 454-455, fig. 6, female, Panama. 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 48, synonymy.

This species, the largest of the group in Panama, reaches 13 mm. in length. It is not uncommon on white sand beaches on the Atlantic coast from Bocas del Toro to the Canal Zone and neighboring Colon prov. It bites man readily and has also been taken in light traps. Our records are from Jan. to May in various years. A presumed male, lacking abdomen, has the upper facets well differentiated and demarcated, occupying over two-thirds eye area. There is no tubercle at vertex. The above synonymy was established through the kindness of Dr. L. L. Pechuman, who compared specimens of **ananasi** with the damaged type of **changuinolae**.

**Stenotabanus (Aegialomyia) littoreus (Hine)**

**Tabanus littoreus** Hine, 1907, Ohio Naturalist, 8(2): 227-228, female, male, Puerto Barrios, Guatemala.



**Stenotabanus (Aegialomyia) littoreus:** Fairchild, 1953, Ann. Ent. Soc. Amer., 46(2): 270, Pl. 1, fig. 6, Panama, references.

Only a few specimens have been taken in Panama, a female from near Pina, Colon prov., biting man on the beach, Nov. 1950; 8 females, Ft. Sherman Reservation, Canal Zone, 24 Dec. 1965, biting man on beach; and a male taken in a light trap in Mojinga Swamp, C. Z. Jan. 1953. The latter locality is a tidal swamp along the lower Chagres river near the Atlantic coast. The female from Pina was kindly compared with Hine's type by Dr. Philip. The species ranges north to Belize, from where I have a long series taken at Corozal in May 1960 by John Strangways-Dixon. These latter specimens have the pale sublateral patches more extensive than the Panama specimens, generally connected by a narrow isthmus to the median pale stripe and to the pale hind borders. The eyes in life of Panama specimens are reddish purple with 2 broad grayish green stripes above and below the middle. The upper margin is also grayish green. Or the eye may be described as grayish green with 3 reddish purple stripes.

**Stenotabanus (Aegialomyia) paitillensis** Fairchild

**Stenotabanus (Aegialomyia) paitillensis** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 299, fig. 12, female, Panama; 1947, Op. cit., (1046), 39(4): 569; Philip, 1958, Amer. Mus. Novit., No. 1921, p. 3, in key.

Five specimens of this little species (9-10mm) have been taken in or near mangrove swamps on the Pacific coast from Garachine, Darien prov., to Aguadulce, Cocle prov. Two were taken attempting to bite, one in a light trap, in Feb., March and April. It is to be separated from related species by smaller size as well as the characters in the key. The eyes in life have the upper and lower margins purple, the green middle of the eye crossed by 2 narrow purple stripes.

**Stenotabanus (Aegialomyia) pompholyx** Fairchild

**Stenotabanus pompholyx** Fairchild, 1953, Ann. Ent. Soc. Amer., 46(2): 273-274, Pl. 1, fig. 4, female, Panama.

Only the two type specimens are known, both taken in a light trap at Patino Point, Darien Prov., July 1952. This locality is at the mouth of the Tuira river, on the Pacific coast. The type is denuded, the paratype lacks the abdomen. When describing this species, I had doubts as to its subgeneric placement, but feel now that it fits best in the present subgenus, in spite of having but 2 green bands on eye. The wings are more clearly spotted on crossveins than others of the subgenus in Panama.

Subgenus **Brachytabanus** Fairchild

**Brachytabanus** Fairchild 1942, Ann. Ent. Soc. Amer., 35(3): 300; 1971, Cat. S. Amer. Dipt., Fasc. 28, p. 50.



The subgenus can be recognized by its small size, broad frons, and 3 annulate antennal style. Only one species occurs in Panama.

***Stenotabanus (Brachytabanus) longipennis* Kroeber**

***Stenotabanus longipennis*** Kroeber, 1930, Encyc. Entom., Ser. B., Dipt. 5 (1929), p. 125, Pl. 1, fig. 23, Pl. 2, fig. 7, 37, Pl. 3, fig. 55, female, Venezuela.

***Stenotabanus (Brachytabanus) longipennis***: Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 300-301, fig. 4, female, Panama; 1964, J. Med. Ent., 1(2): 175, male. Wilkerson 1979, Cespedesia 8(31-32): 219-220.

Aside from being the smallest species of ***Stenotabanus*** in Panama, less than 7 mm., this species is easily recognizable by the combination of very broad frons, small round callus, black tentorial pits, 3-annulate style, and abdomen with a broad yellowish middorsal stripe. The eye in life is glaucous green with three narrow reddish purple bands and a reddish purple patch in the upper inner corner, next the vertex. The male has much enlarged upper facets and two round black velvety spots on subcallus. In Panama, females have been taken mostly biting man or in a Shannon trap, the single male at light. It has been taken from the Canal Zone east to Darien Prov., entirely on the Pacific coast, and on the Pacific coast of Costa Rica, generally near rivers or the coast. Records indicate it flies at least from April to September, but it may be more abundant and widespread, as its small size causes it to be easily overlooked. It ranges from Costa Rica to Colombia and Venezuela.

**Genus *Himantostylus* Lutz**

Lutz 1913, Mem. Inst. Osw. Cruz, 5(2): 183-184. Fairchild, 1965, Psyche 72(3): 211-213, fig. 1. Panama.

The genus contains but one hitherto rare species, similar in appearance to ***Lepiselaga*** and ***Selasoma***. From the first it differs in lacking metallic scale-like hairs, and in normal discal cell and less extensively black wings, from the last in smaller size, less swollen tibiae, more slender and cylindrical third antennal segment, and in having a prominent tubercle at vertex and banded eyes. The wings are basally black to ends of basal cells in ***Himantostylus***, to middle of discal cell in ***Selasoma***.

***Himantostylus intermedius* Lutz**

***Himantostylus intermedius*** Lutz 1913, Mem. Inst. Osw. Cruz, 5(2): 183-184, Pl. 13, fig. 22, male, Yahuarmayo, E. Peru. Stone, 1934, Rev. Ent., 4(2): 191-192, female, Canamina, Bolivia. Wilkerson 1979, Cespedesia 8(31-32): 223-224, fig. 58.

This species has been known only from the type male and the female described by Stone, until found in Panama (Fairchild, 1966). In July 1963 I was fortunate enough to secure a series of 59 females and 1 male on the upper Rio Tacarcuna, Darien Prov., 1900 ft. The habits are rather peculiar. The flies



were concentrated about the shore of a semi-permanent forest rain pool. They flew close to the ground and clustered on my boots, which were of black rubber with canvas tops. They attempted to bite the rubber, but not the canvas, and when I placed my hand on the rubber, they crawled freely over the fingers, but without attempting to bite. None were taken in a Shannon trap placed within a few feet of the pond, though one was taken on my boots in camp a quarter of a mile away, and another seen crawling over a discarded ration can in camp. The male was taken at light in camp. Tapirs had used the pool as a wallow and were apparently common in the vicinity, while large frogs and basilisk lizards were other possible sources of a blood meal.

These Panama specimens differ from the descriptions of Lutz and Stone and from a specimen from Quincemil, Dept. Cuzco, Peru, 16-31 oct. 1962, 2450 ft., L. E. Pena coll. given me by L. L. Pechuman, in having the black on wing bases covering the whole base of the wing basal of a line from costa at ends of basal cells to tip of anal cell (1st A). The Peruvian specimens have only the basal cells black, the remainder of the basal area only slightly dusky. The male has the head notably wider than thorax, the upper area of enlarged facets well differentiated and demarcated from the small facets, and occupying about two-thirds of eye area. There is a small tubercle at vertex, with vestiges of 3 ocelli. The basicosta is sharply pointed and without macrotrichiae in both sexes. The species may be more common and widespread than suspected, as its peculiar habits render it quite inconspicuous. A recent specimen from Costa Rica, Puntarenas prov., is like those from Panama, as is one from Rio Raposo, Buenaventura, Colombia. It is possible that specimens from West of the Andes, including those from Panama and Costa Rica may prove subspecifically distinct from the Amazonian nominate form.

### Genus *Diachlorus* Osten Sacken

Osten Sacken 1876, Mem. Boston Soc. Nat. Hist., 2, Pt. 4(4): 47.  
Fairchild 1942, Ann. Ent. Soc. Amer., 35(3): 295, full references;  
1972, Fla. Ent. 55(4): 219-229, key. Wilkerson and Fairchild 1982,  
Proc. Ent. Soc. Washington 84(3): 636-650, figs. 1-5, key.

Only two species of this chiefly South American genus have been taken in Panama, separated below. Both attack man readily, as well as domestic animals. They are both small yellow insects with black and yellow striped mesonota, vividly patterned eyes, and black-tipped wings.

### Key to Species

- Frons over 5 times as high as basal width. Thorax with prominent isolated dark spots on each side anteriorly, and a broad median dark stripe with hair-fine central yellow line ..... **jobbinsi** (p. 55)  
Frons 4 times as high as basal width. Thorax without anterolateral dark spots, and median dark stripe divided by a broad yellow line widened posteriorly ..... **curvipes** (p. 55)



**Diachlorus curvipes** (Fabricius)

**Haematopota curvipes** Fabricius, 1805, Syst. Antl., p. 107, South America.

**Diachlorus curvipes:** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 296-297, fig. 3 full references; 1946, Op. Cit., 39(4): 567, male. Wilkerson 1979, Cespidesia 8(31-32): 225.

The species occurs most abundantly in the lowlands of Darien Prov., but has been taken in the Canal Zone and neighboring Panama Prov., and at Almirante, in Bocas del Toro Prov. It appears to fly throughout the year, though seemingly more abundant in the dry season. It has been taken in light traps, stable traps, and biting man and horse. All specimens have come from near sea level, except for two collections on the slopes of Cerro Pirre, Darien Prov., 1500 ft., and there was a swamp at that locality. It has not been taken in heavy forest, but seems to prefer open country near swamps or large rivers. The male is similar to the female. The species ranges from Costa Rica south to Paraguay.

**Diachlorus jobbinsi** Fairchild

**Diachlorus jobbinsi** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 296, female, Panama; 1946, op. cit., 39(4): 567, fig. 7; 1953, Proc. Ent. Soc. Washington, 55(5): 241. Wilkerson 1979, Cespidesia 8(31-32): 326-227.

This was one of the dominant species of Tabanids at our Yellow Fever Station near Almirante, Bocas del Toro Prov., over 3000 specimens being taken over a period of 2 years, almost entirely attacking man at ground level in the forest. Elsewhere in Panama, the species occurs at El Real, and Yape in the Rio Tuira Valley, and at Cerro Pirre, Darien Prov. A few specimens, including males, have also been taken in light traps and stable traps on the Atlantic side of the Canal Zone. At Almirante, the species flies throughout the year, but all records from elsewhere are for Jan., Feb., and Mar. The male is like the female in color and structurally similar to the male of **curvipes**.

Specimens have been seen from Costa Rica, Colombia and Ecuador.

**Genus Hemichrysops** Kroeber

Kroeber 1930, Zool. Anz., 88(9-10): 226. Monotypic.

**Hemichrysops fascipennis** Kroeber

**Hemichrysops fascipennis** Kroeber 1930, Zool. Anz., 88(9-10): 237-238, figs. 9-10, female, Colombia; Fairchild, 1964, J. Med. Ent., 1(2): 175-176, fig. 12, full references. Wilkerson 1979, Cespidesia 8(31-32): 227-228, fig. 59.

This is a small, slender, long-winged insect, the wings black except for a small hyaline area covering ends of basal cells, and axillary cell lightly infuscated. The body is wholly shining black, the frons narrow with slender callus,



the antennae slender and **Diachlorus**-like. Only two specimens have been taken in Panama, at Rio Changena, 2400 ft., and Rio Uri, 3000 ft., Bocas del Toro Prov., in heavy forest. The species is known from Colombia and Costa Rica as well.

The male is like the female in color, except that the hyaline area in the wings is smaller. The eyes are bare and an upper area of much enlarged and well demarcated facets covers about half eye area. There is a small tubercle sunk between the eyes at vertex. The antennae are dull yellowish, the style dusky. Palpi dull yellowish, shorter than in female and porrect, and with long sparse hairs. The abdomen also has long sparse pale hairs on sides of first 3 segments, and vestiges of a small white-haired triangle in middle of tergite 4. The description is based on a specimen taken at light, Rio Raposo, Valle, Colombia, 17 Aug., 1965, by Vernon Lee.

Genus **Bolbodimyia** Bigot

Bigot 1892, Wien. Ent. Zeits., 11: 162. Kroeber, 1929, Encycl. Ent., B, Dipt., 5: 109-112 and figs. Stone, 1954, Ann. Ent. Soc. Amer., 47(2): 248-254, keys, synonymy. Wilkerson 1979, Cespidesia, 8(31-32): 228-235, key.

Species of this genus are, with two exceptions, largely black insects with black wings having the extreme tip sharply hyaline. In addition to the characters in the key, the upper branch of third vein(R2+3) is bent sharply forward, so that the first submarginal cell (3rd R) is somewhat coarctate. The third antennal segment is very long and slender, with a blunt dorsal angle close to the base. The eyes in life have the upper third purplish black, the lower 2/3 purplish black with irregular green speckles. The species are apparently crepuscular or nocturnal, though sometimes taken during the day in heavy shade. They seem limited to heavy forest, and most of our specimens were taken in Shannon traps or horse-baited stable traps. Members of the genus seem nowhere abundant, perhaps due to secretive habits. Three species are known from Panama, keyed below.

Key to females

- 1. Largely bright yellow species, the wing basally yellow, the abdomen with broad median yellow stripe above ..... **galindoi** (p. 57)  
Wing and dorsal surface of body wholly intensely black..... 2
- 2. Hyaline of wing apex extending into first submarginal cell. Frons, subcallus and fronto-clypeus wholly orange. First antennal segment orange, only slightly inflated. Mid and hind tarsi basally white .....  
..... **erythrocephala** (p. 57)  
Hyaline of wing apex confined to second submarginal cell (4th R). Abdomen and thorax beneath, all femora, as well as frons, subcallus and frontoclypeus orange. First antennal segment black, greatly inflated. All tarsi dark ..... **philipi** (p. 57)



***Bolbodimyia erythrocephala* (Bigot)**

***Atylotus erythrocephalus*** Bigot, 1892, Mem. Soc. Zool. France, 5: 668, female, Panama.

***Bolbodimyia erythrocephala***: Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 294, full references. Stone, 1954, Ann. Ent. Soc. Amer., 47(2): 252-253. Wilkerson 1979, Cespedia, 8(31-32): 231-232.

In addition to the characters in the key, this species has the palpi, all legs except tarsi, and entire thorax and abdomen black.

I have seen, besides the type, 13 specimens, from 6 localities in Panama, Almirante and Rio Changuena, Bocas del Toro Prov., Cerro Campana and Cerro Jefe, Panama Prov., and Tacarcuna Yellow Fever Sta. and Cerro Mali, Darien Prov. All these localities are in heavy forest in areas of high rainfall, and all except Almirante are at elevations between 2000 and 5000 ft. All were taken between May and September, mostly in Shannon traps. The species is known from Panama, Costa Rica and Colombia.

***Bolbodimyia galindoi* Fairchild**

***Bolbodimyia galindoi*** Fairchild, 1964, J. Med. Ent., 1(2): 172, fig. 5. Wilkerson 1979, Cespedia 8(31-32): 232-234.

Only the type and 2 other specimens of this aberrant species are known. It is similar to ***philipi*** in degree of inflation of first antennal segment, and to ***erythrocephala*** in extent of hyaline at wing tip, but differs from the other local species in color. The wing is yellow with a subapical black patch and a broad band of grey extending along hind margin from R4 to base of anal cell. The thorax is bright orange yellow with a median black streak, the abdomen yellow with a pair of dorsolateral broad black stripes. The type was taken in a Shannon trap at the Tacarcuna Yellow Fever Station, Darien Prov., 30 Aug. 1958, 2200 ft., and the other known Panama specimen at Cerro Campana, Panama Prov. 16 July 1966, 2000 ft., C. W. Myers coll. Wilkerson (loc. cit.) discusses the differences, largely tinctorial, between the single known Colombian specimen and the 2 from Panama.

***Bolbodimyia philipi* Stone**

***Bolbodimyia philipi*** Stone, 1954, Ann. Ent. Soc. Amer., 47(2): 253-254, female, Guatemala, Costa Rica, Panama, Colombia. Fairchild, 1964, J. Med. Ent., 1(2): 172, male described. Wilkerson 1979, Cespedia 8(31-32): 230-235.

***Bolbodimyia bicolor***: Fairchild, 1951, Ann. Ent. Soc. Amer., 44(3): 452. Not ***bicolor*** Bigot.

This species has been taken at Ft. Davis., C. Z., at Cerro Campana, and Las Cumbres, Panama Prov., and on Barro Colorado Id., C. Z., in Dec., June and July in various years. Three of the 10 specimens taken in Panama were males taken at light, the females in Shannon traps and horse baited mosquito traps. Wilkerson (loc. cit.) believes it very likely that this species is but a color vari-



ant of **bicolor**, or at most a subspecies, an opinion with which I concur. Material is still very scanty in this genus, and a final decision on specific limits must await its accumulation.

### Genus **Selasoma** Macquart

Macquart 1838, Dipt. Exot, 1(2): 187. Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 289, full references; 1966, Psyche 72(3): 210-211(1965).

c This genus contains but one widespread species.

### **Selasoma tibiale** (Fabricius)

**Tabanus tibialis** Fabricius, 1805, Syst. Antl., p. 102.

**Selasoma tibiale**: Fairchild, 1942, loc. cit. p. 290, fig. 1, full references. Wilkerson 1979, Cespedia 8(31-32): 235-236, fig. 60.

The species is easily recognizable by its stout build, swollen tibiae, shiny blue-black abdomen, basally black wings, and third antennal segment with the broad flat basal plate many times longer than the reduced style. The eye is greenish black, without bands. In Panama the species is definitely nocturnal, and has been taken attacking man and horses and in horse-baited stable traps. The flight season appears to be short; all our material was taken in December or January, in various years. Specimens have been seen from three localities in the Canal Zone, and from Rio Mandinga on the border between Colon and San Blas, all at low elevation and near water. Range is from Oaxaca, Mexico, to southern Brasil.

### Genus **Chlorotabanus** Lutz

Lutz 1909, Inst. Osw. Cruz em Manguinhos, p.30. Fairchild, 1940, Rev. Ent., 11(3): 714, full references. Philip and Fairchild, 1956, Ann. Ent. Soc. Amer., 49(4): 313-324, keys. Fairchild 1969, Arq. Zool. S. Paulo 17(4): 208.

The genus was revised with keys, figures and synonymy by Philip and Fairchild in 1956. The species are nearly unicolorous pale greenish insects of crepuscular habits and without frontal callus, attacking domestic animals but rarely man and often attracted to lights. Two species, keyed below, are known from Panama.

### Key to species.

- Wings with distinct dark spots on all crossveins and at tips of longitudinal veins. All tibiae black-haired at tips ..... **mexicanus** (p. 59)
- Wings without black spots, glass-clear, only costal cell yellowish. Tibiae wholly pale haired ..... **inanis** (p. 59)



**Chlorotabanus inanis** (Fabricius)

**Tabanus inanis** Fabricius, 1794, Ent. Syst., 4: 368.

**Chlorotabanus inanis:** Fairchild, 1940, Rev. Ent. 11(3): 714-715, fig. 1, full references. Philip and Fairchild, 1956, Ann. Ent. Soc. Amer., 49(4): 316-317, fig. 1, synonymy. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 102, figs, 13, 25. Wilkerson 1979, Cespedia 8(31-32): 239.

This species is similar to **mexicanus** in habits and occurrence. It has been taken in all months save April and October, in the Canal Zone, Panama, Colon, San Blas and Darien Provinces, and probably occurs throughout the country at low elevations. There are, however, no records for the Almirante area, where **mexicanus** is common. The range is more extensive than that of **mexicanus**. I have seen specimens from Mexico (Tabasco), Colombia, Venezuela, Trinidad and Brazil as far south as Matto Grosso. Goodwin and Murdoch (1974) described the larva and pupa, taken among decaying leaves in small pools in a nearly dried up stream bed. Wilkerson (loc. cit.) did not find this species in western Colombia, though it has been taken in Antioquia and Meta, and is a common species throughout the Amazon Valley.

**Chlorotabanus mexicanus** (Linnaeus)

**Tabanus mexicanus** Linnaeus, 1767, Syst. Nat., 12th Ed., 1, pt. 2, p. 1000.

**Chlorotabanus mexicanus:** Fairchild, 1940, Rev. Ent., 11(3): 715-716, fig. 2, full references. Philip and Fairchild, 1956, Ann. Ent. Soc. Amer., 49(4): 315-316, fig. 1, synonymy. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 102, fig. 13, 26. Wilkerson 1979, Cespedia 8(31-32): 240-241.

In Panama, the species has been taken in all months except October, in the Canal Zone and in the provinces of Bocas del Toro, Panama, San Blas, and Darien, always at elevations below 2000 feet. Males are frequently taken in light traps, and females have been collected biting pigs, cattle, and horses after dark, in Shannon traps operated with a light at night, and in horse-baited mosquito traps. It appears to attack man rarely if at all. Both sexes have been reared from field collected larvae on several occasions, the larvae among dead leaves in slow flowing water or in aquatic vegetation. It occurs with **C. inanis** in most localities, but the latter seems to be absent from the Almirante area in Bocas del Toro, where **mexicanus** is common. Neither species has been taken in the forest canopy, and both seem rare or absent in areas of heavy forest, perhaps because bait animals were not available. The species ranges from Mexico to Ecuador and Surinam, but I have seen no authentic Brazilian specimens. Goodwin and Murdoch (1974) described the larva and pupa, taken in similar habitats to those where **inanis** occurred. The greenish brown-mottled larvae of the 2 species are very similar.



Genus **Phaeotabanus** Lutz

Lutz 1913, Brasil Medico, 27(45): 6. Barretto, 1950, Ann. Fac. Med. Univ. S. Paulo, 25: 26, full references. Medem, 1981, Cespedesia 10(37-38): 123-146.

**Tabanus (Phaeotabanus):** Kroeber, 1934, Rev. Ent., 4(3): 304.

Three species of this small genus occur in Panama. All seem to be crepuscular or nocturnal and not strongly attracted to man. Although not referring to any Panamanian species, Medem (op. cit.) observed that species of **Phaeotabanus** were the dominant tabanids attacking caimans in eastern Colombia. He did not report nocturnal activity.

## Key to Species

1. Dorsum of thorax and abdomen black. Whole ventral surface including subcallus, face, antennae, palpi and legs bright orange. Wings deep black with a sharply hyaline apex. Male similar but with mesonotum and scutellum bright orange ..... **phaeopterus** (p. 61)  
Whole insect dull yellowish, abdomen slightly greenish in life. Wings yellowish or grayish, with an unusually long appendix on fork of third vein. Males similar ..... 2
2. Legs yellow. Abdomen yellowish, unicolorous.. **longiappendiculatus** (p. 60)  
Legs largely blackish. Abdomen with a broad yellowish middorsal stripe. .... **atopus** (p. 60)

**Phaeotabanus atopus** (Fairchild)

**Stenotabanus atopus** Fairchild, 1953, Ann. Ent. Soc. Amer., 46(2): 271-272, Pl. 1, fig. 3, female, Panama.

**Phaeotabanus atopus:** Philip and Fairchild, 1956, Ann. Ent. Soc. Amer., 49(4): 314.

The type series was taken at our Yellow Fever Station inland from Almirante, Bocas del Toro Prov., in a Shannon trap at ground level, in the months from June to August, 1951. Aside from these specimens, only a few others have been seen, from Palmar and Golfito, Dept. Puntarenas, Costa Rica. In addition to the key characters, the species is darker throughout than **longiappendiculatus**, with quite smoky wings, and the antennal plate is broader, more excavated, the dorsal angle more acute.

**Phaeotabanus longiappendiculatus** (Macquart)

**Tabanus longiappendiculatus** Macquart, 1855, Dipt. Exot., Suppl. 5, p. 32, female, Honduras.

**Cryptotylus luteoflavus** Bell.: Fairchild, 1940, Rev. Ent., 11(3): 718-719, fig. 3, female, Panama, references; 1946, Ann. Ent. Soc. Amer., 39(4): 567, male.



**Phaeotabanus longiappendiculatus:** Philip and Fairchild, 1956, Ann. Ent. Soc. Amer., 49(4): 314-315, references and synonymy.

The species has been taken in some numbers along the Rio Chagres above Gamboa, and occurs also in Panama Province and at Almirante, in Bocas del Toro Prov. It is nocturnal and has been taken at light, in Shannon traps and biting domestic animals. Most records are from the dry season months Dec. to May, with isolated records in Nov. and June. From the limited data, it appears that the species prefers lowland areas near swamps and large rivers. It ranges north to Mexico and south to Venezuela. It somewhat resembles a species of **Chlorotabanus**, but is less greenish, has a frontal callus, and very long appendix at fork of third vein.

### **Phaeotabanus phaeopterus** Fairchild

**Phaeotabanus phaeopterus** Fairchild, 1964, J. Med. Ent., 1(2): 176, figs. 8, 9. Wilkerson 1979, Cespedesia 8(31-32): 241-242.

In coloring this species resembles some species of **Bolbodimyia**, but the larger size, lack of swollen subcallus and basal antennal segments, narrow frons and broad antennal plate easily distinguish it. In Panama it is known only from the types from Darien Prov., both sexes taken at light. Wilkerson (loc. cit.) reports the species also from Western Colombia and some paratypes came from Madre de Dios in eastern Peru, where more recent collectors have secured further material in flight traps.

### Genus **Dichelacera** Macquart

Macquart 1838, Mem. Soc. Roy. Sci. Agric. Arts. Lille, pt. 2, p. 116.  
Fairchild and Philip, 1960, Stud. Ent. 3(1-4): 1-90. Pl. 1-X, key, synonymy.

Three subgenera and twelve species occur in Panama, treated separately by subgenus below. All the species appear to be forest inhabitants, some in the canopy and others at ground level. All attack man readily and, so far as known, all are diurnal, though males and occasionally females, are taken attracted to light.

### Subgenus **Dichelacera**

The ten Panamanian species of this subgenus are all slender species usually with banded abdomens and wings with a diagonal dark fascia from apex to fifth posterior cell, which may fill most of the wing beyond basal cells. All have at least a single eye band and dark scutellums in the female. The species are discussed in alphabetical order for ease of reference.



Key to Species

- 1. Males (unknown in **crocata**, **hartmanni**, **regina**).....2  
Females.....9
  
- 2. Upper eye facets greatly enlarged, sharply differentiated and demar-  
cated from small facets. Inner border of wing fascia even or un-  
even .....3  
Upper eye facets slightly enlarged, not sharply differentiated and de-  
marcated from small facets. Wing fascia faint and dilute, its inner  
margin nearly straight .....7
  
- 3. Wing largely black, hyaline only along hind margin from apex to fifth  
posterior cell and a band from base of discal cell to hind margin.  
Legs black except for white mid tibiae and all tarsi. Abdomen and  
thorax entirely black .....**melanosoma** (p 66)  
Wing with extensive hyaline or yellow areas. Abdomen always and tho-  
rax usually with pale transverse bands .....4
  
- 4. Thorax wholly yellow haired, including scutellum, Wings with dark fas-  
cia dilute, its inner margin even .....**marginata** (p. 65)  
Thorax with scutellum and a band between wing bases black. Dark wing  
fascia intense, its inner margin step-like or sinuous ..... 5
  
- 5. Dark wing fascia with a clear area in first to third posterior cells and  
its inner margin sharply step-like. Black thoracic band over twice  
as wide as yellow prescutellar band. Yellow hairs only on third and  
fourth abdominal tergites .....**fasciata** (p. 64)  
Dark wing fascia uniform, without light fenestra, its inner border sinu-  
ous. Black thoracic band narrower, and yellow hairs on additional  
tergites .....6
  
- 6. Inner margin of dark fascia passing through fork of third vein. First ab-  
dominal tergite wholly yellow haired, 3 to 5 with yellow hairs on  
hind margins ..... **submarginata** (p. 68)  
Inner margin of dark fascia passing well proximal to fork of third vein.  
First tergite yellow-haired, second to fourth with broad yellow-  
haired median triangles .....**rex** (p. 67)
  
- 7.(2) Thorax without prescutellar pale band, almost wholly dark haired. Ab-  
domen largely dark haired, at most with sparse yellow hairs on hind  
borders of tergites 1 to 4. Legs entirely dull blackish .....  
.....**scapularis** var. **aquilus** (p. 68)  
Thorax with a prominent prescutellar pale band.....8
  
- 8. Prescutellar pale band as wide as or narrower than inter-alar black band.  
Abdominal tergites 2 to 5 predominantly black haired. Legs yellow  
to dusky ..... **scapularis** (p. 67)  
Prescutellar pale band markedly wider than inter-alar black band. Ab-  
dominal tergites predominantly yellow haired. Legs yellow except  
for black hind tibiae and tarsi, and fore tarsi .....**princessa** (p. 66)



- 9.(1) Thorax and abdomen entirely black, except for narrow white-haired hind marginal band on first tergite. Wings largely black, as in male. All femora black, all tibiae over half white. Fronto-clypeus black, bare and shiny ..... **melanosoma** (p. 66)  
 Thorax and abdomen rarely unicolorous; at least basal cells always hyaline; fronto-clypeus always pollinose ..... 10
10. Fifth and following abdominal tergites wholly dark and dark haired.....11  
 At least fifth tergite with pale hind border or tuft or triangle of pale hairs ..... 14
11. Dark wing fascia with markedly step-like inner border and a more or less prominent hyaline patch in first to third posterior cells First tergite and narrow hind borders of third and fourth pale yellowish-white pilose, the remainder of abdomen black ..... **fasciata** (p. 64)  
 Wing otherwise or second tergite with yellow haired hind border or triangle ..... 12
12. Proximal margin of dark fascia weakly sinuous to nearly straight, passing through fork of third vein. Fascia filling wing evenly to margin, the basal clear areas strongly yellow tinged. Frons rather narrow, the callus nearly square. Yellow abdominal bands on tergites 2 to 4 even or slightly wider in middle ..... **regina** (p. 66)  
 Proximal margin of fascia strongly sinuous to step-like passing well proximal to fork of third vein. Frons broader, the callus higher than wide ..... 13
13. Black interalar band very broad, the prescutellar yellow band narrow, hardly one-third as wide. Outer parts of dark fascia dilute, somewhat as in **fasciata**. Yellow abdominal bands narrow and even .....  
 ..... **hartmanni** (p. 65)  
 Black interalar band generally narrower, rarely over twice as wide as yellow prescutellar band. Dark fascia usually of even intensity. Abdominal bands consisting of deep yellow triangles, that on the second tergite smallest, those on third and fourth often extended laterally to sides of tergites ..... **rex** (p. 67)
- 14.(10) Proximal margin of wing fascia more or less sinuous, passing through fork of third vein. Fascia dark and of even intensity to wing margin, rarely with a more dilute area in first to third posterior cells. Eyes green with a broad median band and upper third purple .....  
 ..... 15  
 Proximal margin of fascia straight or somewhat dentate, generally passing proximal to fork. Fascia faint and dilute, strongest along proximal border. Eyes green with a narrow purple median stripe ..... 16
15. Proximal border of fascia smoothly sinuous, basal hyaline area strongly yellow. Abdominal yellow bands very wide, occupying over two-thirds width of their respective segments, widest in middle, that of fifth tergite usually a broad triangle ..... **crocata** (p. 64)



- Proximal border of fascia almost step-like, basal hyaline area slightly or not at all yellow. Abdominal yellow bands even, not over half width of segments, that on fifth tergite often reduced to a small patch ...  
 ..... **submarginata** (p. 68)
16. Mesonotum and abdomen almost wholly dark haired, at most a few pale hairs before scutellum, and on hind borders of tergites, the pale bands of abdomen in integument only. Femora dark yellowish to blackish .....**scapularis** var. **aquilus** (p. 68)  
 Mesonotum and abdomen with prominent yellow-haired bands.....17
17. Prescutellar pale band narrower than interalar dark band. Abdominal pale bands usually narrower than the black. Legs with fore and hind femora dusky to nearly black. Pale hairs generally whitish .....  
 ..... **scapularis** (p. 67)  
 Prescutellar pale band as wide or wider than dark band., Abdominal pale bands as wide or usually wider than dark bands. Femora all yellow. Pale hairs generally rich golden or brassy .....18
18. Frons wider, 2.5-3.1 times as high as basal width.....**marginata** (p. 65)  
 Frons narrower, 3.4-4 times as high as basal width .....**princessa** (p. 66)

### **Dichelacera (Dichelacera) crocata** Fairchild

Fairchild 1953, Ann. Ent. Soc. Amer., 46(2): 263-264, Pl. 2, fig. 10, female, Panama. Fairchild and Philip, 1960, Studia Ent., 3(1-4): 27-28.

An intensely yellow species with tergites 1 to 5 broadly yellow pilose and the wings deeply yellow tinted. Specimens have been taken only at our Yellow Fever Station near Almirante, and on the Rio Changena, 2400 ft., both in Bocas del Toro Prov. Both localities are heavy forest in areas of true rain forest. The species is highly arboreal; only one of 45 specimens seen from Panama was taken at ground level. It is known elsewhere from Costa Rica and Nicaragua, at the latter locality probably also from tree top collections, although not so labelled. Specimens have been taken from April to December. The eye in life is green with a broad median purple stripe and the upper margin broadly purple.

### **Dichelacera (Dichelacera) fasciata** Walker

**Dichelacera fasciata** Walker 1850, Ins. Saunders. Dipt., 1: 68. Fairchild and Philip, 1960, Stud. Ent., 3(104): 32-33, Pl. 3, fig. 9, full references and synonymy. Wilkerson 1979, Cespidesia 8(31-32): 251-253, fig. 63.

**Dichelacera analis** Hine: Fairchild, 1940, Ann. Ent. Soc. Amer. 33(4): 696-697, fig 1.

This is the most abundant and widespread species of the genus in Panama. It is readily recognized by the irregular step-like dark wing fascia, narrow pale abdominal bands only on tergites 3 and 4, contrastingly whitish first tergite, and paired dark spots on anterior border of mesonotum.



The species attacks man and domestic animals readily at ground level in forested areas below 2500 ft. It was taken once attacking a sloth in the forest canopy. It has been taken almost wherever collections have been made, even in fairly young second-grown forest, and is often sufficiently abundant to be a real pest. The flight period includes the whole rainy season, from May through November. Outside of Panama, the species ranges north to Nicaragua and south to western Colombia and Ecuador.

***Dichelacera (Dichelacera) hartmanni* Fairchild and Philip**

***Dichelacera (Dichelacera) hartmanni* Fairchild and Philip 1960, *Studia Ent.*, 3(104): 37-39, Pl. 3, fig. 8, Pl. 7, fig. 4, female, Panama.**

This uncommon species is close to *D. rex*, but darker, the yellow markings reduced in extent, the abdominal triangles often reduced to small spots or a narrow pale pilose hind margin on tergites 2 to 4. The frons is wider than in *rex* and the callus larger and more prominent. Specimens have been seen from higher elevations in Chiriqui prov. (Sta. Clara, La Fortuna), Bocas del Toro prov. (Rio Changena Yellow Fever Camp), Veraguas prov. (Sta. Fe); Cocle prov. (El Cope) and Panama prov. (La Zumbadora, upper Rio Pacora), taken in the months of April, June, Aug., and Sept., mostly in Shannon traps or U. V. light traps. The male is like the female, but with wider pale abdominal bands. The eyes have the upper facets well demarcated and differentiated from the small, occupying about 1/2 total eye area, structurally like the male of *D. rex*, but considerably darker.

***Dichelacera (Dichelacera) marginata* Macquart**

***Dichelacera marginata* Macquart 1847, *Dipt. Exot.*, Lille Mem., Suppl. 2: 30, female, Cayenne. Fairchild and Philip, 1960, *Studia Ent.*, 3(1-4): 44-47, Pl. 2, fig. 7, Pl. 8, fig. 10, full references and synonymy. Wilkerson 1979, *Cespedesia* 8(31-32): 253-254, fig. 79.**

In spite of further study of additional material, I am still unable to separate females of *marginata*, *princessa*, and *scapularis* with certainty, although the males of at least the first two are quite distinct. I have now seen 2 males of *marginata* from Almirante, Bocas del Toro Prov. taken at light in the forest canopy, a finding which negates our previous statement (Fairchild and Philip, 1960, p. 55) that *marginata* does not occur west of the Canal Zone. Our previous records of *princessa* from at least the Atlantic coast of Panama in Bocas del Toro Province should thus probably be referred to *marginata*. Whether females from Chiriqui are *marginata* or *princessa* must await the finding of males.

As defined in the key, and with the exception of the doubtful Chiriqui material, specimens have been seen from 18 localities in Darien, Panama, Colon, and Bocas del Toro Provinces, and the Canal Zone. Most localities are in lowland forest, a few up to 2400 ft. elevation. The species is taken in light traps, horse-baited mosquito traps, and attracted to man, almost entirely at ground level. Records are from May to October, although at Almirante it has also been taken in January. The species ranges from Costa Rica to northern Brazil and



eastern Peru. Wilkerson (loc. cit.) records it only from extreme northern Choco on the Pacific coast of Colombia, but it is abundant on the eastern side of the Andes and the Amazon basin.

**Dichelacera (Dichelacera) melanosoma** Hine

**Dichelacera melanosoma** Hine 1920, Ohio J. Sci. 20(8): 316, fig. 1, female, Costa Rica. Fairchild and Philip, 1960, Studia Ent. 3(1-4): 47-48, Pl. 5, fig. 7, full references. Wilkerson 1979, Cespedia 8(31-32): 254-255, fig. 64.

The species is easily recognizable by the largely black wings and body with largely white tibiae. It seems to be rare and local in Panama, only two specimens having been taken, one at Progreso, Chiriqui Prov., the other on the Rio Paya, in Darien Prov. Both were taken at ground level in heavy lowland forest, in July and August in different years. The species is known elsewhere from Costa Rica and Colombia, the Interoceanic Canal Survey having taken a series at Teresita, Choco, in a Malaise trap. These Colombian examples and the one from Rio Paya are darker than Costa Rican and Chiriqui specimens, the hyaline area in fifth posterior cell and base of discal cell, and the hyaline outer margin of wing noticeably narrower. This may be another case of discontinuous distribution, the main isthmian area separating 2 populations which show signs of becoming morphologically distinct.

**Dichelacera (Dichelacera) princessa** Fairchild and Philip

**Dichelacera (Dichelacera) princessa** Fairchild and Philip 1960, Studia Ent., 3(4): 53-55, Pl. 4, fig. 3, M, F, Costa Rica.

Whether this species is actually represented by females from western Chiriqui must await the finding of males, as pointed out under **marginata**. The only material seen is 1 from Chorchá, Chiriqui and a considerable series from Camp Pital in the Coto region near the Costa Rican border taken by Dunn in 1929. These average smaller than Costa Rican examples, and the frons seem narrower than in **marginata**.

**Dichelacera (Dichelacera) regina** Fairchild

Fairchild 1940, Ann. Ent. Soc. Amer., 33(4): 699-700, Pl. 1, fig. 3, female, Panama. Fairchild and Philip, 1960, Studia Ent., 3(1-4): 59-60, full references. Wilkerson 1979, Cespedia 8(31-32): 256-258, fig 65.

**Regina** is readily separated from **submarginata** by the characters in the key. In addition, the pale bands on tergites 3 and 4 are generally paler and broader than the band on tergite 2, and the basal clear area of the wing usually more yellowish.

The species is taken both at ground level and in the canopy, and at Almirante, where it is abundant, was secured in all months except Oct. and January. Elsewhere it is a rainy season form. Within Panama, it has been taken only in



forested areas of high rainfall, mostly at elevations between 1000 and 2500 ft. It occurs with **submarginata** at several localities, but is most abundant in Bocas del Toro and Veraguas provinces, where **submarginata** has not been taken. The range is from Honduras to Ecuador. At a camp on Rio Tacarcuna, Darien, June-July 1963, **regina** was the dominant **Dichelacera** in the forest canopy, **submarginata** in the canopy and along the forest edge, **fasciata** at ground level within the forest. All three attacked man readily within their habitats.

### **Dichelacera (Dichelacera) rex** Fairchild

**Dichelacera (Dichelacera) rex** Fairchild 1951, Ann. Ent. Soc. Amer., 44(3): 474-448, Pl. 1, fig. 1, female, Panama. Fairchild and Philip, 1960, Studia Ent., 3(104): 60-61, male, full references.

The broad dark yellow abdominal triangles on second to fourth tergites characterize this species. The dark fascia of wing is often less intense along hind margin. The eye in life is green with a narrow purple median stripe and the upper margin tinged with purple.

All specimens, except two taken in a light trap in the forest canopy, have been taken attacking man at ground level or in Shannon traps. The species has been secured in small numbers only. It appears to be confined to areas of heavy forest and high rainfall below 2500 ft. The species is similar to **hartmanni**, but is paler, more yellow, with the abdominal triangles nearly reaching foreborder of their respective segments and the frons narrower. Further material may show the 2 species to be but ecological forms, as they have been taken at the same locality only once. **D. rex** is known from Almirante, Bocas del Toro prov., Rio Mandinga, San Blas prov., Cerro Azul, Panama prov., Tacarcuna, Darien prov. and Heredia prov. Costa Rica, localities mostly at lower elevations than those listed for **hartmanni**.

### **Dichelacera (Dichelacera) scapularis** Macquart

**Dichelacera scapularis** Macquart 1847, Dipt. Exot. Suppl. 2: 31, female, Mexico. Fairchild and Philip, 1960, Studia Ent., 3(104): 61-64, Pl. 1, fig. 12, Pl. 10, fig. 8, full references.

There is much color variation in both sexes of this species. The typical form has dark brown to black femora, a narrow, nearly white, prescutellar band, and narrow whitish abdominal bands. Panama specimens agreeing with this form have been taken only in the Canal Zone area and neighboring Panama Province, in July and October to January. Occurring with this in the Canal Zone area is a paler form with pale femora and generally broader and yellower thoracic and abdominal markings. This pale form is also abundant around Almirante, in Bocas del Toro Prov., where the typical form has not been secured. It has been taken from May to September in Almirante, June to December in the Canal Zone area.

The typical form was described from Mexico, and specimens from Vera Cruz and Tabasco have been seen, as well as 1 from Nicaragua. The pale form occurs also in Nicaragua and Honduras.

Finally what appears to be but a highly melanistic form of **scapularis** is described below.



**Dichelacera (Dichelacera) scapularis** var. **aquilus** var.nov. Male and Female. Differs from **scapularis** only in lacking all or nearly all pale hairs. Palest specimens have yellowish though dark-haired femora, and small tufts of dull yellowish hairs on notopleural lobes, before scutellum and the first tergite partly yellow-haired. Darkest specimens have all body and leg hairs blackish. Of three males seen, two have dark femora and large eye facets not sharply demarcated from small, the other has pale femora and upper eye facets larger and sharply demarcated, in this respect intermediate between males of **scapularis** and **marginata**. Of this dark form,, the following specimens have been studied. Chilibre, Panama Prov., Aug. 1944, 2 females; Ft. Clayton, C. Z. 19 July 1954, horse trap, 1 female; Albrook Field, C. Z., 24 July 1951, horse trap, 1 female; Madden Airstrip, Panama Prov., 15 Nov. 1948, horse trap, 1 female; El Real, Darien Prov., 11 July 1950, in forest canopy, 1 female; Rio Paya, Darien Prov., 10 Sept. and Aug., 1958, 2 females; Ft. Kobbe, C. Z., 24 Aug. 1951, light trap, 1 male; Las Cumbres, Panama Prov., 4 Aug. 1958, on window of house, 1 male; Las Palmas, Veraguas Prov., 16 July 1953, light trap, 1 male. The females from Darien Prov. have pale femora, the male from Veraguas pale femora and demarcated eye facets. As suggested earlier (Fairchild and Philip 1960 p. 63) this dark form and the pale legged form of **scapularis** may be segregates from a hybrid population derived from **scapularis** x **marginata** crosses. Although varietal names have no standing in Zoological nomenclature, I have chosen to give this well-marked variety a name in order to be able to key it and discuss it, but there seems no point in designating conventional types. Named specimens will be deposited in M.C.Z., F.S.C.A. and U.S.N.M.

### **Dichelacera (Dichelacera) submarginata** Lutz

**Dichelacera submarginata** Lutz 1915, Mem. Inst. Oswaldo Cruz, 7(1): 86-87, Pl. 20, fig. 8, female, Venezuela, Peru. Fairchild and Philip, 1960, Studia Ent., 3(1-4): 66-67, Pl. 2, fig. 9, Pl. 7, fig. 3, full references and synonymy. Wilkerson, 1979, Cespidesia 8(31-32): 258-259 fig. 69.

This species is likely to be confused only with **regina**. In addition to the yellow on tergite 5, **submarginata** averages smaller and has a broader frons.

In Panama this seems to be a lower montane species. With few exceptions, specimens have come from elevations between 100 and 5000 ft. in areas of high rainfall in Darien, Panama, Colon, Cocle and Chiriqui provinces. The species seems partly arboreal. At Rio Tacarcuna, Darien prov., **submarginata** was taken abundantly at platforms in the forest canopy, and in the open along the river, but seldom in the forest itself at ground level. At the same locality, **D. regina** also occurred in the treetops, though in far fewer numbers, while **D. fasciata** was abundant at ground level within the forest. The season of flight probably includes the whole rainy season, but our records show collections only from March to September.

The range outside Panama is from Costa Rica to Venezuela and eastern Peru. Wilkerson (loc. cit.) records the species only from northern and eastern Colombia.



Subgenus **Idiochelacera** Fairchild

**Dichelacera (Idiochelacera)** Fairchild 1969, Arq. Zool. S. Paulo 17(4): 210.

Recent collections using a U. V. light trap at La Fortuna, Chiriqui Prov., by Henk Wolda have shown the unexpected presence of a species of this subgenus.

**Dichelacera (Idiochelacera) subcallosa** Fairchild and Philip.

**Dichelacera subcallosa** Fairchild and Philip 1960, Studia Ent. 3(1-4): 83-84, pl IV fig. 8, M., F., Santander Colombia.

**Dichelacera (Idiochelacera) subcallosa**: Wilkerson, 1979, Cespedesia 8(31-32): 261-263, fig. 67. Colombia.

A short series of both sexes was taken at La Fortuna, Chiriqui Prov. in U.V. light traps by Dr. Henk Wolda of the Smithsonian Tropical Research Institute, as follows: 1 female, 28; IX-76; 1 female, 16-22IV-77; 1 male, 23-29-IV-77; 2 males 7-13-V-77; 1 female, 14-20-V-77; 6 females, 21-27-V-77; 1 female, 28-V to 3-VI-77; 1 female, 4-10-VI-77; 1 male, 6-12-VIII-71; 1 male, 3 females, 13-19-VIII-77; 1 female, 10-16-IX-77; 1 male, 1 female, 29-VIII to 4-IX-78; 1 female, 16-22-V-79. The specimens were collected in Kahl solution, and I was not able to make very attractive pinned specimens of them, though they are quite recognizable. These Panama specimens agree with those from western Colombia discussed by Wilkerson in having the antennal plate strongly infuscated and the mid and hind femora more or less prominently infuscated on their apical 1/4 to 1/3. Long series of well preserved specimens may enable definition of a subspecies on each side of the Andes. My specimen from Peru is from Huanuco and is like the types from Santander, Colombia, though the apical darkening of femora is hardly evident. The only specimen seen from Ecuador is from the coast and like the western Colombian specimens cited by Wilkerson.

The males are quite unlike the females in appearance, being largely yellow and yellow pilose, the thorax unmarked, the abdomen yellow and yellow pilose, except for, at most, black pilose hind margins on tergites 2 and 3, the last wholly black pilose except for a median yellow pilose triangle. When denuded, as most of my 8 specimens are, the black markings do not show, as they are due only to pilosity, and the specimens appear entirely yellow. All femora and coxae and mid tibiae are yellow, the hind tibiae and tarsi dusky and black pilose, the fore tibiae white basally, black apically and tarsi black. The male eye has the upper facets well-differentiated and demarcated, the area of enlarged facets occupying over 1/2 the eye area. The area of large facets is densely short pilose and there is a small tubercle sunk between the eyes at vertex. There is no evidence of the bare patch on subcallus so prominent in the female and the dorsal antennal tooth is shorter than in the female.

Subgenus **Desmatochelacera** Fairchild

**Desmatochelacera** Fairchild 1969, Arq. Zool. S. Paulo, 17(4): 210



**Dichelacera (Desmatochelacera) transposita** Walker

**Dichelacera transposita** Walker, 1854, List Dipt. Ins. Brit. Mus., 5: 151, female, West Coast of America.

**Catachlorops transposita**: Fairchild, 1940, Ann. Ent. Soc. Amer., 33(4): 690, fig. 8, full references. Wilkerson 1979, Cespidesia 8(31-32): 263-265, fig. 66.

Only a single species occurs in Panama. It differs from Subgenus **Dichelacera** in having unicolorous greenish black eyes, black wings with a broad hyaline band crossing ends of basal cells and whole wing apex hyaline. Body is black, scutellum reddish and abdomen with a white haired triangle on tergite 4. Legs black, only fore tibiae basally white.

All Panama specimens have been taken east of the Canal Zone on the Atlantic side of the continental divide, from the Rio Pequeni and Rio Boqueron at the head of Madden Lake, to Pito, near the Colombian border. All localities are in heavy forest in areas of high rainfall. Only eleven specimens have been taken, in Feb., Mar., Apr. and September.

The species ranges south through Colombia into Ecuador, always west of the Andes. The type in B. M. is labelled Ecuador, and I have seen specimens from Cachabe, as well as Colombian examples. Barretto (1957) records a specimen from Mt. Roraima, Br. Guiana, but I have not seen this specimen and it may not be conspecific with **transposita**.

**Genus Catachlorops** Lutz

Lutz 1909, Inst. Osw. Cruz. em Manguinhos, p. 29. Fairchild, 1940, Ann. Ent. Soc. Amer., 33(4): 689, full references. Barretto, 1946, An. Fac. Med. Univ. S. Paulo, 22: 151-183; Fairchild, 1969, Arq. Zool. S. Paulo, 17(4): 210.

Only 1 of the several subgenera of **Catachlorops** is represented in Panama, the bulk of the species of the genus being Brazilian.

**Subgenus Psalidia** Enderlein

**Psalidia** Enderlein 1922, Mitt. Zool. Mus. Berlin 10: 344.

Four species and 1 well-marked variety occur in Panama, separated by the subjoined key. All have narrow frons and slender ridge-like callus, very slender palpi, unbanded eyes, and characteristic wing patterns. Males of 3 species are known and easily associated with their respective females.

**Key to females of Psalidia**

1. Dorsal spine of third antennal segment short, seldom reaching end of basal plate. First posterior cell of wing broadly open. Black or grayish species with a white triangle on fourth tergite. Wings hyaline with an irregular blackish band beyond end of discal cell, the wing apex hyaline ..... **umbratus** (p. 73)



Dorsal spine longer, extending beyond end of basal plate. First posterior cell closed and petiolate, rarely narrowly open. Dark brown to yellowish species, with abdomen unmarked or a faint median stripe. Wings otherwise .....2

2. Wings sharply patterned, with a clearly defined hyaline band extending across wing from costa to hind margin between end of discal cell and ends of basal cells. Basal cells and distal band dark brown, the latter with large oval clear fenestra in marginal and submarginal cells, and most of apical cell hyaline .....**scurrus** (p. 73)  
Wings diffusely patterned, without a sharp median band..... 3
3. Legs entirely deep black and black pilose, except for narrowly yellow knees and paler coxae. Body pilosity brown ventrally and laterally, black dorsally, without a median dorsal abdominal stripe. Wings as in **ocellatus**.....**fortunensis** (p. 72)  
Legs yellow to red except darker apices of foretibiae and all tarsi more or less apically infuscated. Pilosity of legs and body yellow to coppery red, the abdomen always with a more or less distinct broad dorso-median stripe of paler pilosity .....4
4. Costa, basal cells, discal cell and bases of marginal and submarginal cells yellowish to lightly smoky, a contrasting black spot at end of stigma, and fenestra in marginal and submarginal cells large and distinct. Body vestiture yellowish. Eyes generally uniformly bright green ..... **fulmineus** var. **ocellatus** (p. 71)  
Whole wing more or less deep brown, with hyaline or subhyaline fenestra in discal cell, below stigma, and in apices of marginal and submarginal cells. Body color generally deep rufous. Eyes usually faintly bicolored, darker in upper half ..... **fulmineus** (p. 71)

### **Catachlorops (Psalidia) fulmineus** (Hine)

**Tabanus fulmineus** Hine, 1920, Ohio J. Sci., 20(6): 186. Female, Gatun, Canal Zone.

**Dichelacera (Psalidia) fulminea**: Fairchild, 1942, Ann. Ent. Soc. Amer., 35(4): 472.

**Psalidia ocellata** Enderlein, 1925, Mitt. Zool. Mus. Berlin, 11(2): 393, female Muzo, Colombia. Fairchild, 1940, Ann. Ent. Soc. Amer., 33(4): 693, fig. 9, full references.

**Dichelacera (Psalidia) fulminea** form **ocellata**: Fairchild, 1961, Rev. Biol. Trop. 9(1): 27.

**Tabanus festivus** Hine, 1920, Ohio J. Sci., 20(6): 187, female, Gatun, Canal Zone. Dunn. 1934, Psyche, 41(3): 174. Not **T. festivus** Wied. 1828.

**Bellardia furcata** Bigot, 1892, Mem. Soc. Zool. France, 5: 631, female. Patrie inconnue. Not **Dichelacera (Psalidia) furcata** (Wied.) 1828.

**Catachlorops (Psalidia) fulmineus**: Fairchild 1971, Cat. Dipt. Americas S. of United States, 28, Tabanidae p. 71. Wilkerson 1979, Cespedesia 8(31-32): 270-272, figs. 73, 74.



The two forms of this species separated in the key are indistinguishable structurally, and not all specimens can be placed with certainty on color characters. I have seen the types of all the names referred here; **fulmineus** is the rufous form with dark wings, all the other names refer to light specimens for which **ocellatus** End. appears to be the only available name.

In Panama both forms occur in the same localities and seem to range throughout the country in heavy forest at altitudes below 2500 ft. Both were fairly abundant around Almirante in Bocas del Toro Prov. and at Sta. Fe in the mountains of Veraguas Prov. Elsewhere the form **ocellatus** seems the more abundant, though **fulmineus** has been secured at eight localities, including the Canal Zone and Darien Prov. Both forms are also on the wing at the same time. With the exception of three **ocellatus** in January and two in September, all specimens were taken in the months from May to August.

Males of each form have been seen, 1 of **ocellatus**, 5 of **fulmineus**. They differ only as to color, in the same way as the females. Notes on the color of the eyes in life, available for three **fulmineus** and five **ocellatus**, indicate that the eyes are bicolored in **fulmineus**, either bicolored or uniformly green in **ocellatus**. In the bicolored eye, the upper two fifths is darker, sharply separated from the lower lighter green.

Aside from Panama material, I have seen specimens of **f. ocellatus** from Vera Cruz and Tabasco, Mexico; Peten, Guatemala; Lancetilla, Honduras; Bluefields, Nicaragua; Limon Prov., Costa Rica; Muzo and Buenaventura, Colombia. **Fulmineus** seems rarer, but I have specimens from Lancetilla, Honduras and Costa Rica. Wilkerson (loc. cit.) took the **ocellatus** form in western Colombia (Cauca, Guapi), but reported the **fulmineus** form only from Choco and Antioquia.

#### **Catachlorops (Psalidia) fortunensis** Fairchild n. sp.

A large dark species with black legs and dark brown antennae, bare subcallus, closed first posterior cell and wing pattern like **C. (P.) ocellata**.

Female. Length 18mm., of wing 15.5 mm. Eyes bare, color and pattern unrecorded. Frontal index 10.4, divergence index 1.7. Frons dark reddish brown pollinose, the callus dark brown, nearly black. Subcallus largely bare, somewhat inflated, rugose, yellowish brown, the pollinose margins yellow brown, somewhat paler than frons. Frontoclypeus and genae concolorous, the sparse beard dark brown. Vertex with a slender bare stripe continuing down behind the head. A dense fringe of stout black bristles forming a postocular band just below eye margin. Scape and pedicel dark brown, thinly pollinose, densely black setose. Basal plate dark reddish brown, dorsal spine and style blackish. Palpi dark brown, densely black haired. Proboscis thick, dark brown, labella black, largely shiny and sclerotized.

Mesonotum with reddish brown integument, dark brown pollinose and with a slender dark median stripe, wholly black pilose. Scutellum concolorous. Pleura slightly paler, its pollinosity grayish brown, with long brown hairs. Coxae concolorous with pleura. Femora, tibiae and tarsi all entirely black and black haired, except for the yellow femoro-tibial junction. Wings not distinguishable from those of **ocellata**. Basicosta blackish without macrotrichiae. Halteres dark orange.

Abdomen with mahogany red integument, subshiny, dorsally entirely black or very dark brown pilose, ventrally with paler integument and pale pollinosity with slightly paler hairs on hind margins of sternites.



Holotype female, Chiriqui Prov., Panama, Fortuna, 1000 meters elev. 12-23-VIII-1976, H. Wolda coll. To be deposited in F. S. C. A. The specimen lacks the left mid leg and the terminal annulus of left antenna.

It is with some hesitation that this single specimen is described, but its very distinctive black legs and dark color separate it readily from the 2 other Panamanian species, **ocellata** and **fulmineus**. The frons is also narrower than any other specimens measured.

A male taken in a U. V. light trap at Fortuna on 27-1977 by Dr. H. Wolda may be the male of this species. It is, however, more reddish than the type, with red legs and orange pilose thorax and abdomen. The wings, though crumpled (the specimen was preserved in alcohol for 5 years) appear to have the same pattern as the female, with the substigmatic spot emphasized, as in **ocellata**. It is, however, very much darker than the single available male of that species, both in body and wings. In body color it is closer to **fulmineus** males, but the wing lacks the extensive dark infuscation of that species.

### **Catachlorops (Psalidia) scurrus** Fairchild

**Catachlorops (Psalidia) scurrus** Fairchild 1958, Ann. Ent. Soc. Amer., 51(6): 526-527, figs. 8, 18, female, Panama; 1971, Cat. Dipt. S. Amer., Fasc. 28: 71 synonymy.

This species is rare in Panama, though probably widespread, as records are available from Darien and Panama provinces and the Canal Zone. All were taken during the dry season from Jan. to March and on the dryer Pacific side of the Isthmus, so the species is separated both ecologically and seasonally from **fulmineus**. It may be more common than indicated by the records, since little collecting has been done during its flight season. The species occurs in Guatemala and Mexico, and most probably in intervening areas, though no records are available. The eye is bronzy in life, without markings. There seem no records from south of Panama.

### **Catachlorops (Psalidia) umbratus** (Hine)

**Tabanus umbratus** Hine, 1920, Ohio, J. Sci., 20(6): 187, female, Costa Rica.

**Catachlorops umbratus**: Kroeber, 1934, Rev. Ent. 4(2): 274.

**Dichelacera (Catachlorops) umbratus**: Fairchild, 1951, Ann. Ent. Soc. Amer., 44(3): 448-450, fig. 2, Panama, full references;

This species is highly arboreal. Of 32 specimens now available, 27 were taken attracted to human collectors in the forest canopy, two were taken at ground level and three lack information. The bulk of our specimens therefore have been collected where canopy collections were made, and distribution may be wider than records indicate. The species has been taken east of the Canal Zone, along the continental divide at about 2000 ft., on the Atlantic side of the same range (Cerro Azul), and at a few other localities in the same general area. We also have a short series from the upper Rio Tuira, in Darien Province, and from Chorchá, Chiriqui Prov. Most specimens were taken in February, with lesser numbers in December, January and March, in various years. The eyes in life are bright emerald green, unicolorous.



The male is similar in all non-sexual characters to the female. The eyes are bare with an upper area of greatly enlarged facets clearly demarcated from the small facets and occupying about two-thirds of the eye area. There is a small tubercle in the notch at vertex, without vestiges of ocelli. The palpi are clubbed and bluntly falcate. Plesiotype male, Las Cumbres, Panama Prov., 23 Feb. 1959, G. B. Fairchild coll., taken on window of house.

Due possibly to its highly arboreal habits, the species is known so far only from Costa Rica and Panama, though Wilkerson (1979) gives an unconfirmed report of the species' occurrence in Antioquia, Colombia.

### Genus *Dasychela* Enderlein

Enderlein 1922, Mitt. Zool. Mus. Berlin, 10(2): 345. Fairchild, 1969, Arq. Zool. S. Paulo, 17(4): 212.

### Subgenus *Dasychela* End.

The genus is a small one of a few specialized species localized in north-western South America. The species have unicolorous pubescent or rarely bare eyes, long proboscis, long dorsal tooth on third antennal segment and a dark wing pattern which excludes the crossveins at apex of basal cells. Only a single species occurs in Panama.

### *Dasychela (Dasychela) badia* (Kroeber)

*Dicladocera badia* Kroeber, 1931, Rev. Ent., 1(14): 402, fig. 3, female, Panama. Fairchild, 1940, Ann. Ent. Soc. Amer., 33(4): 689, fig. 7.

*Stypochela badia*: Fairchild, 1958, Ann. Ent. Soc. Amer., 51(6): 518, Pl. 2, fig. 14.

*Tabanus venenatus*: Hine 1917, Trans. Amer. Ent. Soc., 43(765): 295, Costa Rica. Not Osten Sacken 1886.

The species is easily recognized in our fauna by the uniform dark brown color, the abdomen with faintly paler broad mid-dorsal pilose triangles on tergites 3 and 4, and the wings with a diffuse broad brown band which leaves the crossveins and apex hyaline. The dorsal tooth on third antennal segment is very long and with a recurved tip, reaching well beyond end of basal plate. The proboscis is unusually long, over twice length of palpi, brown pollinose with small compact labella. The pilose eyes are dark purplish green in life, unbanded.

Panama material is all from areas of heavy forest and high rainfall, in Darien, Colon, and Bocas del Toro provinces, and in the mountains at about 2000 feet in Panama, Cocle and Veraguas provinces. The species has usually been taken from January through March, in the dry season, but a long series from Cope, Cocle prov. was secured in Aug. 1977 by R. B. and L. S. Kimsey. At the right place and time, it may be abundant and annoying, as it attacks man readily.

I have seen the Costa Rican specimen on which Hine's misdetermined record was based. Hine later, in his MS notes on a visit to the British Museum, saw the types of *venenatus*, and two specimens of the present species and realized his error. In his collection when I studied it in 1940, this Costa Rican specimen



was labelled **Dichelacera peruviana** Bigot, comp. with type, and it is indeed closely related. It is possible that further collecting in Colombia and Ecuador will show that **badia** is but a northern race of the earlier described **peruviana**. The species ranges from Costa Rica into eastern Panama and probably extreme northwestern Colombia, though I have no records from the latter country.

### Genus **Dicladocera** Lutz

Lutz 1913, Brazil Medico, 27(45): 5. Fairchild, 1969, Arq. Zool. S. Paulo, 17(4): 217.

### **Dicladocera nigrocoerulea** (Rondani)

**Tabanus nigrocoeruleus** Rondani, 1850, Nouv. Ann. Rend. Accad. Sci. 1st. Soc. Agric. Bologna (3)2: 191.

**Dicladocera nigrocoerulea**: Fairchild, 1972. Cat. S. Amer. Dipt. Fasc. 28, p. 74, synonymy. Wilkerson, 1979, Cespedia 8(31-32): 297-298, fig. 94.

The single species of this genus occurring in Panama is a large stout shiny black insect, with the wings basally black to beyond end of discal cell. There are clear fenestrae in ends of basal cells and middle of discal cell, and a small median tuft of white hairs on tergite 4. It differs from species of **Stibasoma** by having some setae on basicosta, soft pollinose labella on proboscis and slender tibiae.

Three females were taken at Cana, in the mountains of Darien Prov. between 28 July and 11 Aug., 1965. The species ranges thence to Venezuela and Ecuador. It is surprising that only one of 16 species of **Dicladocera** listed by Wilkerson from western Colombia reaches Panama, and that one only in extreme eastern Panama.

### Genus **Stibasoma** Schiner

Schiner 1867, Verh. z. b. Ges. Wien, 17: 310. Fairchild, 1940, Ann. Ent. Soc. Amer., 33(4): 684, full references; 1953, Ann. Ent. Soc. Amer., 46(2): 267, key. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 112-114.

**Rhabdotylus** Lutz, 1909, Inst. Osw. Cruz em Manguinhos, p. 29. Fairchild, 1942, Ann. Ent. Soc. Amer., 35(4): 472. Barretto, 1951, Arq. Mus. Nac. Rio de Janeiro, 42: 72-73. Fairchild, 1950, Psyche, 57(4): 125.

Flies of this genus are generally thick-set hairy bee-like species, with bare unicolorous or bicolored eyes. In Panama most of the species seem predominantly arboreal in habits, and unless collections are made in the forest canopy, they are rarely taken. The group may not be a natural one, as one or more of the combination of characters used to define it may be absent or poorly developed in any given species. Thus the tibiae are sometimes slender and do not always bear especially long hair fringes. The frontal callus is usually flat and nearly as wide as frons, always extended above in a narrow or broad ridge to



the vertex. Many species have the frons extensively bare, especially at vertex. Most species have the wings colored or patterned, seldom entirely hyaline. The antennae seem always short, seldom equalling the usually inflated palpi in length.

**Rhabdotylus** Lutz is retained in a subgeneric sense for a small group of greenish bodied species which have the head characters of **Stibasoma** but are less hairy, and lack inflated tibiae. The known males resemble their females, (except **chionostigma**) but have bare holoptic eyes, with a large and well demarcated area of enlarged facets in the upper two-thirds of the eye. All of the species discussed here, and no others, were reported from western Colombia by Wilkerson (1979), who also figured the wings of 3 of the species.

### Key to species

1. Tibiae not inflated. Wings with only costal cell tinted, veins at most lightly brown-margined. Abdomen grass green to bluish green in life, fading to yellowish, sparsely black haired except for obscure pale-haired median triangles on second to fifth tergites .....  
 .....(**Rhabdotylus**) **venenata** (p. 80)  
 Tibiae inflated. Wings black, yellow or patterned. Abdomen not green 2
2. Wings entirely black except for dilute apex and hind margin. First two abdominal tergites densely sulfur yellow-haired, remaining tergites varying from almost wholly black-haired to wholly orange rufous. Subcallus denuded and shiny ..... **panamensis** (p. 79)  
 Wings not entirely black. Abdomen otherwise .....3
3. Wings with prominent black markings .....4  
 Wings yellowish tinted or vaguely dusky, without prominent black markings .....5
4. Wings with a prominent subapical black area in outer halves of marginal and first submarginal cells, the anterior half of wing otherwise bright yellow. Abdomen black, the first tergite with a short bright yellow hind marginal band or transverse patch, the second with a complete, narrower yellow band ..... **apicimacula** (p. 77)  
 Wings largely black or brown, but with a prominent yellow hyaline patch from costa to and including discal cell, and apex beyond tip of R2+3 hyaline. Abdomen black or brown above, but with all sternites with broad yellow-haired hind margins ..... **chionostigma** (p. 77)
5. Large species, over 16 mm. Wings deep black at extreme base, remainder yellowish brown tinted basally, the apex and hind margin broadly grayish hyaline. Thorax entirely deep velvety black. Abdomen with first tergite black, second tergite black or usually partly or wholly rufous orange-haired, remainder all rufous orange. Second to last tergites with sulfur yellow-haired hind marginal bands of variable width ..... **flaviventre** (p. 78)  
 Smaller species, less than 14 mm. Wings yellowish hyaline to base, the outer margin and apex broadly dusky grayish. Thorax ranging from black to orange rufous-haired, with a white or orange hair tuft be-



fore wing bases and on each side of scutellum. Abdomen ranging from nearly entirely black to partly orange rufous, always with at least traces of yellow hind marginal bands on tergites 2 and 3, usually all tergites prominently banded .....**fulvohirtum** (p. 79)

### ***Stibasoma apicimacula* Fairchild**

***Stibasoma apicimacula*** Fairchild 1940, Ann. Ent. Soc. Amer., 33(4): 686-688, Pl. 1, Fig. 6, female, Panama; 1951, Ann. Ent. Soc. Amer., 44(3): 451-452; 1953, Proc. Ent. Soc. Washington, 55(5): 241.

This species is the least bee-like of the Panama species. In addition to the characters in the key, the insect is black including antennae and palpi. Legs black, including tarsi, with white hairs at bases of all tibiae, hind coxae, and base of hind femora dorsally. Thorax usually with small white hair tufts before and below wing bases. Abdomen with yellow hairs in middle of hind margin of first tergite and a complete narrow hind marginal band on second. All sternites with narrow pale-haired hind margins. Subcallus bare and shiny in middle.

The bulk of our material has come from Yellow Fever camps along the upper reaches of the Rio Mandinga, between Colon and San Blas. It also occurs at Almirante, Bocas del Toro, at El Valle, Cocle Prov., and at Sta. Fe, Veraguas Prov., the last two localities in mountain forest above 2000 feet. Of the twenty-eight specimens bearing data, twenty-six were taken at platforms in the forest canopy. Panama records run from May to September. Specimens from Rio Raposo, near Buenaventura, Colombia, were taken in Jan., May, and June 1964. They were also taken at platforms in the forest canopy. A single specimen is also known from Costa Rica.

### ***Stibasoma chionostigma* (Osten Sacken)**

***Tabanus chionostigma*** Osten Sacken, 1886, Biol. Centr. Amer., Dipt. 1: 54, Pl. 1, fig. 11, female, Guatemala. Knab, 1913, Proc. U. S. Nat. Mus. 46, No. 2033, p. 411.

***Stibasoma chionostigma***: Fairchild, 1940, Ann. Ent. Soc. Amer., 33(4): 685, fig. 5, Panama, full references; 1964, J. Med. Ent., 1(2): 171. 1971; Cat.S.Amer.Dipt. Fasc. 28, p. 75 synonymy.

***Stibasoma pachycephalum*** Bigot, 1892, Mem. Soc. Zool. France, 5: 636, Mexico. Fairchild, 1956, Smiths, miscell. Colls., 131(3): 25, Types seen.

***Stibasoma flavistigma*** Hine, 1912, Ohio Nat., 7(7): 516, female, Mexico.

***Stibasoma bifenestrata*** Philip, 1966, Ann. Ent. Soc. Amer. 59(2): 526, figs. 5, 12, female, Nicaragua.

The species is easily recognized by the black and yellow patterned wings. The subcallus and face are silvery pruinose, rarely the former bare in middle, the beard and palpi white haired. Thorax is mainly black, but with silvery white hair tufts above fore coxae, before and beneath wings bases, and on each side of scutellum. Legs are black, black-haired except for silvery hair patches on bases of all tibiae. Abdomen black haired above, apparently with pale hairs on last one or two tergites, beneath all sternites with wide yellow-haired hind borders.



This is the rarest Panama *Stibasoma*, as only a few specimens are known, from Chiriqui, Canal Zone, and Cerro Azul, Panama Prov., as previously reported (Fairchild 1940). Additional specimens are 1 female, France Field, C. Z., 12 May 1964 in horse baited mosquito trap; 1 female without data, probably Canal Zone, and 1 male, Barro Colorado Id., C. Z., 25 June 1967, taken at U. V. light, R. G. Beard coll. It is probably arboreal, like its congeners, but no information is available. This species ranges from Mexico to Colombia.

The male is quite different in appearance, the wing having a broad yellow band from costa to hind margin covering the basal and most of anal and auxiliary cells. The abdomen is yellow in ground color, with tergites 1 and 3 to 6 black-haired, 2 yellow-haired. Mesonotum chocolate brown, the scutellum reddish. Legs as in female. Eyes with upper facets much enlarged, covering fully 2/3 of eye area, brown and sharply demarcated from the small facets. Antennae as in female, but more slender. Face and cheeks silvery pollinose, white-haired. Palpi oval, porrect, blackish. Proboscis with fully sclerotized labella.

The species seems quite variable in color characters, some being wholly black in body color, others quite reddish. The subcallus may be largely bare and shiny, or thinly silvery pollinose, the former condition possibly due to wear.

### *Stibasoma flaviventre* (Macquart)

*Tabanus flaviventris* Macquart, 1848, Dipt. Exot., Supp. 3, p. 11, Pl. 1, fig 4, female, Rio Negro.

*Stibasoma flaviventre*: Kroeber, 1934. Rev.Ent., 4(2): 263, references. Fairchild, 1956, Smiths. Miscell. Colls., 131(3): 17, synonymy, type seen. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 112, figs, 21, 33.

*Stibasoma stilbium* Fairchild, 1953, Ann. Ent. Soc. Amer., 46(2): 264-267, Pl. 2, fig. 11 Panama; 1953, Proc. Ent. Soc. Washington, 55(5): 241.

In addition to the characters in the key, the legs are wholly black, including tarsi, black-haired except for patches of silver white hairs at bases of all tibiae on outer surface. Subcallus silvery white pruinose, as is face to a lesser degree. Halteres all black. Sternites with yellow hind marginal bands. As with most species of *Stibasoma*, color is variable, the abdomen varying from mainly yellow-haired to mainly copper-haired.

In Panama the species is rare and probably highly arboreal. Our four specimens from Almirante, Bocas del Toro Prov., were all collected in the canopy. Three additional specimens, from Tacarcuna and Rio Tuira, Darien Prov., and La Zumbadora, Cerro Azul, Panama Prov., though not so labelled, were probably taken in the canopy, as tree platform collecting was underway at all three localities. We also have 7 females from Lancetilla, Tela, Honduras, all taken in the treetops, and 2 from Teapa, Tabasco, Mexico, probably also from the forest canopy. Records include all months from March to September. The male is like the female in color. The eyes are bare, holoptic, with a large area of sharply demarcated large facets entirely surrounded above by a strip of small facets. There is no visible tubercle at vertex. The eye of the female in life is bi-colored, black above, greenish black below, the two colors sharply separated. The species ranges from Mexico at least to the northern Amazon basin. Specimens have been seen from Guatemala, Surinam and Colombia in addition to those mentioned above, while a subspecies occurs on Trinidad.



Goodwin and Murdoch (1974) collected 10 larvae from between the leaf bases of arboreal Bromeliaceae, from which they reared a single male. The larvae are nearly black, the pupae with long horn-like thoracic spiracles.

***Stibasoma fulvohirtum* (Wiedemann)**

***Tabanus fulvohirtus*** Wiedemann, 1828, Auss. zweifl. Ins. 1: 155, female, Brazil.

***Stibasoma fulvohirtum*:** Fairchild, 1940, Ann. Ent. Soc. Amer., 33(4): 685, fig. 4, Panama, full references; 1951, Ann. Ent. Soc. Amer., 44(3): 451; 1971, Cat. S.Amer. Dipt., Fasc. 28, p. 76, synonymy. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 114, figs 21, 34.

In addition to the characters in the key, the subcallus and face are silvery pruinose, palpi black or partly silver-haired. Femora black, tibiae bicolored, first and last pair white at base, mid pair mostly white, tarsi yellowish, white-haired. Eyes unicolorous, reddish green in life.

This is the most abundant and widespread species of the genus in Panama. It has been taken at 11 localities from Darien to Chiriqui, most abundantly in lowland forest on both coasts and appears to fly throughout the year. It is predominantly arboreal, and is attracted readily to man. Goodwin and Murdoch reared over 20 adults from larvae collected in terrestrial Bromeliaceae at 6 localities from Bocas del Toro to Darien.

I have seen the type of ***compactus*** Walk. in British Museum, and types of ***fulvohirtum*** Wied. in Berlin, Frankfurt and Vienna. All are paler than any Panama specimens, perhaps due to fading with age. The species is reported from Costa Rica to Brazil. Panama material varies much in color of vestiture, some having largely golden-haired thorax and prominently banded abdomens, to almost totally black specimens.

***Stibasoma panamensis* Curran**

***Stibasoma theotaenia panamensis*** Curran, 1934, Fam. Gen. N. Amer. Dipt., p. 153, fig. 23, head, no description. Fairchild, 1951, Ann. Ent. Soc. Amer., 44(3): 451, fig. 3.

***Stibasoma theotaenia* var. *panamensis***, Fairchild, 1940. Ann. Ent. Soc. Amer., 33(4): 685-686, Panama, full references.

***Stibasoma panamensis***, Fairchild 1953, Ann. Ent. Soc. Amer., 46(20): 267, key.

Easily recognizable among Panama species by the black wings and bright yellow basal 2 segments of abdomen. The eyes in life are bicolored, black above, paler grayish, below, with a sharp line of demarcation. Legs are black except for rufous tarsi and patches of white hair at bases of at least hind tibiae. Knob of halteres ivory white, stem black. Subcallus somewhat inflated, bare and shiny. Size is variable, from a wing length of 10mm. to 14mm.

The species is fairly common in the forest canopy at Almirante in Bocas del Toro Prov., and on the Rio Mandinga, which forms the border between Colon and San Blas. It has been taken a few times on the Atlantic side of the Canal Zone (Barro Colorado Id. and Ft. Sherman) and in nearby Panama province



(Arraijan, Chorrera, Cerro Azul). We have also seen 4 females from Lancetilla, Tela, Honduras, July, Aug. 1953, Jan. 1954, and 4 females Curiche, Choco, Colombia, April, May, and Oct. 1967. Of the 24 specimens on which data are available, 16 were taken at platforms in the forest canopy. It appears to be on the wing throughout the year. Abdominal colors appear to vary with geography. All those from Honduras have tergites 3-6 pale orange and orange pilose, as do those from Bocas del Toro, and 1 from Arraijan, Panama prov. The Mandinga, Colon Prov. specimens, have tergite 3 largely black-haired, the remainder dark coppery, more or less mixed with black. A specimen from near Pacora, Panama prov., has these tergites all coppery red-haired, while those from Darien Prov. and Choco, Colombia have tergites 3 to 5 entirely black-haired. These latter specimens much resemble *Stibasoma theotaenia* Wied. in color, but are structurally quite distinct, so that *panamensis* cannot be a subspecies of *theotaenia*.

***Stibasoma (Rhabdotylus) venenatus* (Osten Sacken)**

***Tabanus venenatus*** Osten Sacken, 1886, Biol. Centr. Americana, Dipt., 54, female, Guatemala, Panama.

***Rhabdotylus venenatus***: Stone, 1944, Bol. Ent. Venez. 3(3): 130, Venezuela. Fairchild, 1956, Smiths. Miscel. Colls., 131(3): 31, types seen. Philip, 1960, Proc. Calif. Acad. Sci., Ser. 4, 31(3): 87, designates lectotype.

***Stibasoma (Rhabdotylus) venenata***: Fairchild, 1971, Cat. Dipt. S.Amer., Fasc. 28, p. 77. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 114, figs. 21, 35.

***Gymnochela (Amphichlorops) venenatus***: Kroeber, 1932, Rev. Ent., 2(1): 92-93, fig. 32, male, female, Venezuela, Ecuador, Bolivia, Guatemala, Panama, Costa Rica.

***Amphichlorops venenata***: Kroeber, 1934, Rev. Ent., 4(2): 271.

The three species belonging to this group, *planiventris* Wied., *viridiventris* Macq., and *venenata* O.S., are difficult to separate, but I have now seen the types of all three, and about 25 additional specimens. *Planiventris* Wied. has the narrowest frons, the basal callus is small, rather flat, and surmounted above by two slender depressions or pits which define the beginning of the slender median ridge reaching toward the vertex. The antennae are short and stubby. The abdomen, in undenuded specimens, usually has the second and third tergites wholly yellow-haired and always with yellow-haired lateral margins, the fourth to sixth tergites wholly black-haired, the seventh again pale haired. The wings are yellowish tinted, with more or less strongly brownish or yellowish margin of the veins. The femora are largely or wholly black-haired.

*Viridiventris* has a broader frons, the frontal callus rounder, more protuberant, and merging almost imperceptibly into the broader more flattened and less defined central ridge. It lacks the pair of pits above the callus. The antennae are less stubby than in *planiventris*. The abdomen has extreme sides of all tergites with some pale hairs, the second and third tergites may have narrow pale-haired hind borders as well. The wings are somewhat fumose in the basal cells and below stigma, but lack the brown or yellow vein margins usual in *planiventris*. The femora are consistently black haired.

*Venenata* is similar to *viridiventris* in the frons and callus, though generally with still broader frons, but with both callus and central ridge better defined, the former usually clearly separated from eye margins, and in one specimen,



indications of the pits found in **planiventris**. The antennae are definitely longer and more slender, more deeply bifid, than either of the other two species. All but one of my specimens are badly denuded. The one good specimen, from Panama, has sides of tergites 1 to 5 pale-haired, the last 3 black-haired, the dorsal surface largely black-haired, but with small flat white pilose triangles on tergites 2 to 5. What remains of the vestiture on the other examples corresponds with this pattern. The wings are evenly slightly grayish, the veins faintly to strongly brown margined, as in **planiventris**. The femora are consistently pale haired.

Males of **planiventris** and **viridiventris** have been studied. They are very similar in all respects. The antennae of **viridiventris** are considerably more slender, less chunky. Femora of both are largely pale haired, and abdomens of both entirely yellow haired. Males of **venenata** have not been seen.

**Planiventris** and **viridiventris** appear confined to S.E. Brasil, where they apparently occur together.

Philip (1960) suggested that Central American specimens might belong to two species, both represented in Osten Sackens type series. He felt that they could be separated on color of the vestiture of palpi, femora, and pleura, orange in the Panama specimen selected as lectotype, whitish in the Guatemala specimen. Two of my Panama specimens, from Rio Changuena, Bocas del Toro Prov., 2400 ft., 12 Aug. and 8 Sept., 1961, and another in U. S. N. M. from Caracas, Venezuela, Sept. 1939 agree with the lectotype in these characters, and in having more heavily brown margined veins. A third specimen, from Balzapambana, Ecuador is like these two, but with vestiture but slightly yellow tinged. The three other Panama specimens, from the Cerro Azul area, in Panama province east of the Canal Zone, at altitudes of about 2000 feet, 6 Feb. 1953, 12 Feb. 1955 and 24 Sept. 1956, all have whitish hair on beard, pleura, and femora, but black haired palpi. The wings are lighter, the veins with barely discernible brown margin. A specimen from Carillo, Costa Rica, May 1903, C. F. Underwood, and another in U. S. N. M. from San Carlos, Miranda, Venezuela, are like these last three Panama specimens. There is also a specimen from El Volcan, Chiriqui, Feb. 1936, in A. M. N. H., but I took no notes on color of vestiture. My series also varies much in size, the smallest having a wing length of 11 mm., the largest 16 mm. Longer series of better preserved specimens will be needed to settle this matter, but in view of the notable tendency of species of **Stibasoma** to show color variation, I feel it is more likely that at least **viridiventris** and **venenata** will eventually prove but races of a single species.

In Panama the species has been taken only above 2000 ft. in areas of high rainfall. The three Panama localities are also notable for the abundance of epiphytic and terrestrial Bromeliaceae. Goodwin and Murdoch (1974) succeeded in rearing 2 of 25 larvae collected between the leaf bases of arboreal Bromeliaceae at Cerro Azul, Panama Prov., and Cana, Darien Prov. These yielded a male and a female, both small in size. The male has a yellowish abdomen and orange hairs on pleura, and the wings are badly broken. The female is quite teneral, also with orange haired pleura. The abdomen of the male is almost entirely denuded; that of the female shrunken and discolored. In spite of differences in appearance, I think these are probably **venenata**.

#### Genus **Cryptotylus** Lutz

Lutz 1909 Inst. Osw. Cruz em Manguinhos, p. 29; 1913, Brazil Medico, 45: 5. Fairchild, 1969, Arq. Zool. S. Paulo, 17(4): 212. Philip and



Fairchild, 1956, Ann. Ent. Soc. Amer., 49(4): 313-324, figs. (as subgenus of *Chlorotabanus*). Wilkerson 1979 Cespidesia 8(31-32): 314-316.

The species of this group resemble *Chlorotabanus* in unicolorous greenish or orange coloration, but a small frontal callus is present and the basal plate of antenna has a strong dorsal angle or sharp spine. Like *Chlorotabanus* they are nocturnal. Two species occur in Panama, separated as in the key below.

#### Key to species

- Basal plate of third antennal segment broad, angled below, the dorsal tooth not longer than its width at base. Vestiture orange to dark rufous in females, pale yellow in males. Fork of third vein rarely with a short appendix .....**unicolor** (p. 82)
- Basal plate slender, not angled below, the dorsal tooth longer than its width at base, slender. Vestiture generally paler, yellow in both sexes. Fork of third vein nearly always with a short to long appendix .....**chloroticus** (p. 82)

#### *Cryptotylus unicolor* (Wiedemann)

*Tabanus unicolor* Wiedemann, 1828, Auss. Zweifl. Ins. 1: 141.

***Cryptotylus unicolor*:** Fairchild, 1940, Rev. Ent., 11(3): 719-720, fig. 4, full references. Wilkerson, 1979, Cespidesia 8(31-32): 315-316, fig. 34N.

***Chlorotabanus (Cryptotylus) unicolor*:** Philip and Fairchild, 1956, Ann. Ent. Soc. Amer., 49(4): 318-320, synonymy.

In addition to the characters in the key, this species is usually larger and more rufous in color than *chloroticus*. Males of both species of *Cryptotylus* have small tubercles between the eyes at vertex, lacking in *Chlorotabanus*. In Panama the species is not uncommon along the Chagres river and about Gatun lake. It has also been taken in Darien and Cocle provinces, always at low elevations. Dunn (1934) reported rearing this species from larvae collected in water lettuce plants (*Pistia stratiotes*). Both sexes have been taken in light traps, and females in horse-baited stable traps and biting horses and cattle; it does not appear to be attracted to man. The species probably occurs throughout the eastern half of Panama, ranging thence southward to Bolivia and Brazil. Records include the months from Dec. to Aug. Wilkerson saw specimens only from northern Choco and eastern Colombia.

#### *Cryptotylus chloroticus* Philip and Fairchild.

***Cryptotylus chloroticus*** Philip and Fairchild, 1956, Ann. Ent. Soc. Amer., 49(4): 320-321, fig. 7. Wilkerson, 1979, Cespidesia 8(31-32): 314-315, fig. 34M.

***Cryptotylus limonus*:** Fairchild, 1940, Rev. Ent., 11(3): 720-722, fig. 5; 1942, Ann. Ent. Soc. Amer. 35(1): 88-90. Not Townsend 1897.



In Panama, this species is quite abundant about Gatun Lake in the Canal Zone and nearby Panama, and has been taken also at Aguadulce in Cocle Province, and at Almirante, Bocas del Toro Prov. Unlike **unicolor** it has a short flight period, May through August. It is taken in light traps, horse-baited stable traps, and biting cattle and horses, but not man. It probably occurs throughout the lowlands of Panama in swampy areas. The species ranges southward at least to Sao Paulo, Brazil, but records are scanty. Wilkerson (op. cit.) did not take this in western Colombia.

### Genus **Philipotabanus** Fairchild

Fairchild 1942, Ann. Ent. Soc. Amer., 35(4): 453 (**Tabanus** subgenus);  
1964 J. Med. Ent., 1(2): 179.

**Hemichrysops**, Fairchild 1961, Rev. Biol. Trop. 9(1): 29. Not Kroeber  
1930. Wilkerson, 1979, Cespedesia 8(31-32): 316-332.

This genus includes slender species of small to medium size with ridge-like to drop-shaped callus, generally sparsely setose basicosta, pollinose labella, unicolorous eyes and wings with a dark pattern. The species of the three subgenera are treated separately here.

### Key to Subgenera

1. Wings with an irregular dark pattern of variable extent which always leaves clear areas surrounding all cross-veins and fork of third vein. Frons narrow to very narrow 7 to 10x as high as basal width. Palpi slender. Eyes bronze in life. Always rather slender long-winged species; wings nearly as long as or equalling body length .....  
.....**Philipotabanus** (p. 83)  
Wings ranging from almost wholly blackish to hyaline with a small dark area below stigma, but cross veins and fork of 3rd vein not surrounded by clear fenestra when included in dark pattern ..... 2
2. Slender species with frons 7x as high as wide or narrower, the palpi and antennae slender, proboscis considerably longer than palpi and with small labella. Eyes bright green in life .....**Melasmatabanus** (p. 90)  
Stouter species with broader frons not over 6x as high as wide, palpi inflated, antennae broader, proboscis hardly longer than palpi, the labella large. Eyes green or brick red in life, fading to greenish black .....  
.....**Mimotabanus** (p. 89)

### Subgenus **Philipotabanus**

The nine species of this group known from Panama are keyed below. All the species are primarily forest inhabitants and all attack man to some extent. Most of the species are at least partly crepuscular. **P. magnificus** is at times sufficiently abundant and aggressive to constitute a pest. **P. nigrinubilus** has been reared from larvae taken under the bark of rotten logs. The subgenus ranges from southern Mexico to Bolivia and the northern Amazon region. The species are all very similar in appearance and are difficult to separate in a key.



Key to *Philipotabanus* (*Philipotabanus*)

1. Basal cells of wing entirely hyaline. Dark wing markings reduced to a small patch below stigma. First and second abdominal segments pale horn-color, remainder darker ..... **grassator** (p. 86)  
Basal cells dark on at least basal third. Wing pattern more extensive... 2
2. Entirely black-bodied species with black legs, the abdomen with more or less white hair on sides and posterior borders of some segments. Wings heavily black marked ..... 3  
Dark to pale brown species with brown legs. The wings heavily or lightly marked ..... 4
3. Frons exceedingly narrow, over 10 times as high as basal width, callus black, a narrow raised line. Black wing marking extends from near ends of basal cells to beyond fork of third vein, leaving very small hyaline fenestrae around end of discal cell and fork of third vein. A small middorsal triangle of white hair on fourth tergite. Antennae largely black ..... **nigrinubilus** (p. 87)  
Frons broader, about 7 times as high as basal width, callus broader, spindle or club-shaped. Black wing markings less extensive, not reaching ends of basal cells and with large fenestrae about end of discal cell and fork of third vein. Apex and hind border of wing brownish, contrasting with hyaline fenestrae. Margins of all abdominal segments more extensively white-haired ..... **medius** (p. 87)
4. Apex of wing markedly infuscated. Small species generally with wing length less than 9 mm. Legs blackish, darker than pleura. Scutellum concolorous or paler than mesonotum ..... **magnificus** (p. 86)  
Larger species, generally with wing length over 10 mm. Legs yellow to brown, not darker than pleura ..... 5
5. Mesonotum prominently striped. Scutellum subshiny, conspicuously darker than mesonotum. First posterior cell (5th R) with a more or less well defined longitudinal pale streak. Dark marking in second submarginal cell (4th R) usually unconnected with dark pattern, the latter generally rather streaky and broken. Abdomen light to dark brown with a more or less well defined darker median integumental stripe, and ill defined paler-haired triangles on tergites 3 and 4 .....  
..... **ebrius** (p. 85)  
Without the above combination of characters..... 6
6. No dark spot in second submarginal cell (4th R), wing pattern reduced, pale brown. Whole insect light brown, mesonotum faintly striped, scutellum concolorous or paler. Antenna unusually broad, with long dorsal tooth. Frons 7-8 times basal width ..... **elviae** (p. 86)  
A dark spot at base of second submarginal cell. Antennae more slender, the dorsal tooth no more than an acute angle ..... 7



7. Frons broader 7 to 9 times as high as basal width. Wing pattern black, basal cells over half black, the discal band broader and intense. At least mid and hind tibiae brown or blackish .....  
 ..... **pallidetinctus** (p. 88)  
 Frons very narrow, 9 to 11 times as high as basal width. Wing pattern pale brownish, the basal cells about half hyaline, the discal band narrow. Mid and hind legs yellow .....8
8. Abdomen with a row of small middorsal white-haired triangles. Hyaline fenestra around end of discal cell completely surrounded by brown ..  
 ..... **pterographicus** (p. 88)  
 Abdomen with an ill-defined broad golden-haired triangle on fourth tergite. Hyaline fenestra more or less open behind .....  
 ..... **chrysothrix** (p. 85)

**Philipotabanus (Philipotabanus) chrysothrix** Fairchild

**Tabanus (Philipotabanus) chrysothrix** Fairchild, 1943 (1942), Ann. Ent. Soc. Amer., 35(4): 459-460, Pl. 2, fig. 17, female, Panama.

This species is not separable structurally from **pterographicus** Fchld. but averages slightly larger and more rufous in tone. The wing is like **magnificus**, with dark spikes along posterior veins, but it lacks the apical darkening and the pattern is more reduced, the spot in base of 4th R being small, faint and occasionally absent. All but a few specimens have come from the mountains just east of the Canal Zone in Panama prov. (Cerro Azul, Cerro Jefe) the others from El Valle de Anton, Cocle prov., Rio Pequeni, Colon prov. and several other localities in Darien prov., all localities of high rainfall at elevations of 1000 ft. or more. All material was taken in March, April or May, at the end of the dry season, mostly in Shannon traps or light traps, so that the species is probably crepuscular or nocturnal. Neither seasonal nor geographic range overlaps that of **pterographicus**. The species is so far not known outside of Panama.

**Philipotabanus (Philipotabanus) ebrius** (Osten Sacken)

**Tabanus ebrius** Osten Sacken, 1886, Biol. Centr. Amer., Dipt., 1: 49, Pl. 1, fig. 8, female. Irazu, Costa Rica and Chiriqui, Panama.

**Tabanus (Philipotabanus) ebrius:** Fairchild, 1943 (1942) Ann. Ent. Soc. Amer., 35(4): 455-456, Pl. 2, fig. 14, female, male; 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 78, synonymy.

This is a very variable species, ranging in body color from light yellowish brown to nearly black. As interpreted here, the scutellum is always blackish, and the wing pattern usually has a pale streak through the dark pattern in first posterior cell, sometimes faint. The frontal index ranges from 6 to 8.25, averaging 7.2. The types of **ebrius** are pale, with wings as figured by me.

The species occurs in Panama only in the mountains of Chiriqui and Bocas del Toro provinces, mostly at elevations from 1500 to at least 6000 ft. It appears to fly from April to September, and attacks man and horses. It is at least partly crepuscular or even nocturnal. The species is known elsewhere only from Costa Rica.



**Philipotabanus (Philipotabanus) elviae (Fairchild)**

**Tabanus (Philipotabanus) elviae** Fairchild, 1943 (1942), Ann. Ent. Soc. Amer., 35(4): 460, Pl. 2, fig. 12, female. Buena Vista, Chiriqui Prov., Panama.

The large size, reduced wing pattern and accentuated dorsal antennal tooth serve for recognition. Aside from the types from Chiriqui, the species has been taken only a few times, for a total of 5 specimens, near Almirante June and July, and Rio Changena, Sept., both Bocas del Toro prov. Nothing is known of its habits, except that the specimens were attracted to man. There are 2 females labelled Costa Rica, de Lafon, 1884, in Museum d'Histoire Naturelle, Paris, and a long series was taken on the Osa Peninsula, Puntarenas, Costa Rica in Feb. and Mar. (Hogue and Fairchild 1974).

**Philipotabanus (Philipotabanus) grassator Fairchild**

**Tabanus (Philipotabanus) grassator** Fairchild, 1953, Ann. Ent. Soc. Amer., 46(2): 278-279, Pl. 2, fig. 9, female, Almirante, Panama.  
**Philipotabanus stigmatalis**: Fairchild, 1958, Ann. Ent. Soc. Amer., 51(6): 520. Not Kroeber 1931.

This little species is seemingly rare. I have seen but 3 Panama specimens, 2 from our Yellow Fever Station near Almirante, Bocas del Toro prov., taken in the treetops 30 July 1952 and 30 May 1960, and another also taken in treetops, along the Calderas - Chiriquicito trail, Bocas del Toro, in Oct. - Nov. 1955. I synonymized this species with **T. (Philipotabanus) stigmatalis** Kroeber in 1958 on the basis of the description of the latter and a specimen from British Guiana. Acquisition of additional material from Colombia, Peru and Brasil reveals that 2 distinct species exist. **Philipotabanus grassator** is represented by the Panama specimens above and a single female from Colombia, Dept. Valle, Centro Hydro-elect. Anchicaya, 4 Aug. 1977, M. A. Tidwell coll. This specimen was received too late to be included in Wilkerson's publication (1979). Of **P. stigmatalis** Kroeber, I now have the British Guiana specimen mentioned in 1958, 5 females from the vicinity of Manaus, Amazonas, Brasil, all taken in an arboreal flight trap in July or Aug. 1981, and 1 female from Peru, Madre de Dios, Rio Tambopata Reserve, 20-31-X-1982, R. Wilkerson coll. **P. grassator** is paler, the scutellum and first 2 abdominal segments yellowish brown, the legs, except fore femora yellowish, the wing stigma pale brown, the basal cells without basal infuscation. **P. stigmatalis** is darker, the scutellum blackish except in 1 specimen, the abdomen nearly black, the anterior 2 or 4 tergites bluish pruinose, the legs all entirely black, the wing stigma black, the basal cells 1/2 to 2/3 basally weakly infuscated. The wings of the Peruvian example are slightly darker.

**Philipotabanus (Philipotabanus) magnificus (Kroeber)**

**Tabanus (Phaeotabanus) formosus** Kroeber, 1930, Zool. Anz. 86: 299, fig. 21, female, Ecuador. Not **T. formosus** Wlk, 1848.



**Tabanus (Phaeotabanus) magnificus** Kroeber, 1934, Rev. Ent. 4(3): 305. Ecuador, Costa Rica, Colombia. Nom. nov. pro. **T. (Ph) formosus** Kroeber, 1930 nec Walker 1848.

**Tabanus (Philipotabanus) magnificus:** Fairchild, 1943, Ann. Ent. Soc. Amer., 35(4): 456-458, Pl. 2, fig. 13, (1942) female, Panama. Fairchild, 1953, Ann. Ent. Soc. Amer., 46(2): 278, male.

**Philipotabanus (Philipotabanus) magnificus:** Fairchild, 1971, Cat. Dipt. Amer. S. of U. S., 28: 79. Wilkerson, 1979, Cespedesia 8(31-32): 327-329, fig. 103.

This is the smallest species of the genus, and the most abundant in Panama. It occurs in forested areas from sea level to 5000 ft. throughout the country, and although abundant at ground level is also taken frequently in the forest canopy. It bites man readily and although taken at all hours, is primarily crepuscular, having been taken until 9 p.m. and in light traps. It ranges from Guatemala (Peten) south to Ecuador. The wing pattern varies slightly in extent and intensity, but the species seems less variable than others of the genus. It flies primarily in the rainy season from April to Dec., but seems most abundant in May and June. The examples from east of the Andes in Colombia do not seem to differ from specimens from Dept. Valle on the Pacific coast.

#### **Philipotabanus (Philipotabanus) medius (Kroeber)**

**Tabanus (Phaeotabanus) intermedius** Kroeber, 1930, Zool. Anz. 90: 81, female. Suiza de Turrialba, Costa Rica. Not **T. intermedius** Wlk. 1848, Egger 1859.

**Tabanus (Phaeotabanus) medius** Kroeber, 1934, Rev. Ent., 4(3): 305, nom. nov. pro **T. intermedius** Kroeber, 1930 nec Walker 1848.

**Philipotabanus (Philipotabanus) medius:** Hogue and Fairchild 1974, Rev. Biol. Trop. 22(1): 22.

The type was in Budapest and presumably destroyed. I confused the species with **pallidetinctus**, (Fairchild 1943) but it is distinct; my figures and records under **medius** really refer to **pallidetinctus**. It is separable from **pallidetinctus** in being much blacker, with black scutellum and legs. The wing is almost the same, the basal cells slightly less infuscated, the hyaline spot at end of discal cell generally larger, and apex and hind border definitely smoky. The frontal index is from 5.5 to 7.75. Specimens have been taken only in the mountains of Western Panama, and adjoining Costa Rica as follows: Sta. Fe, Veraguas, May 1950 (1); Posada Gutierrez, Bocas del Toro, 2900 ft., 4 Apr. 1963 (9); Bocas del Toro Prov., 5000 ft., Aug. 1963 (1); Palo Santo, Chiriqui, 25 Aug. 1950 (1); Sta. Clara, Chiriqui, Aug. 1951 (2) and Nov. 1958 (3); Boquete, Chiriqui Aug. 1944 (3). The species is variable, some specimens being quite brownish with less sharp wing pattern, and separable with difficulty from dark extremes of **ebrius**.

#### **Philipotabanus (Philipotabanus) nigrinubilus Fairchild**

**Tabanus (Philipotabanus) nigrinubilus** Fairchild, 1952, Ann. Ent. Soc. Amer., 46(2): 279-280. Pl. 2, fig. 8, female.



**Philipotabanus nigrinubilus** Fairchild, 1964, J. Med. Ent. 1(2): 176-177.  
 Male. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 110, fig. 31. Wilkerson, 1979, Cespedesia 8(31-32): 329-331, fig. 102.

This species is the blackest of the Panama species, easily recognized by the very extensive dark wing patch and small clear spot at end of discal cell. It has been taken near Almirante, in Bocas del Toro province, at Sta. Fe in the mountains of Veraguas prov., in Colon prov. on the upper Rio Mandinga, in Panama prov. at Cerro Azul, and in Darien prov., on the Rio Tacarcuna. All these localities are in areas of heavy forest and high rainfall, mostly at elevations of 1000-3000 ft. Specimens were taken attacking man at ground level or in Shannon traps, and in the months from April to October. Additional specimens were reared from larvae at Rio Changena, Bocas del Toro prov. and Ft. Sherman, C. Z. taken under bark of fallen or felled dead trees. (Murdoch & Goodwin 1974). It is known elsewhere only from a short series taken at Lancetilla, Tela, Honduras, July-Oct., 1953, and 4 females taken at Rio Raposo, Buenaventura, Colombia. Wilkerson (Op. cit.) records the species from the departments of Choco, Valle and Cauca in Colombia.

**Philipotabanus (Philipotabanus) pallidetinctus** (Kroeber)

**Tabanus (Phaeotabanus) pallidetinctus** Kroeber, 1930. Zool. Anz., 86: 297, fig. 19, female, Chiriquicito, Panama.

**Tabanus (Philipotabanus) medius**: Fairchild, 1943 (1942), Ann. Ent. Soc. Amer., 35(4): 458-459, Pl. 2, fig. 16, female. Not **T. medius** Kroeber 1934.

**Tabanus (Philipotabanus) caliginosus**: Fairchild, 1953, Ann. Ent. Soc. Amer., 46(2): 276-277, male. Not **T. caliginosus** Bellardi 1859.

Study of type of **pallidetinctus** in B. M. by myself and types of **caliginosus** Bell. by Philip in Turin indicates that the latter is the prior name for **alteripennis** Wlk. 1860, a Mexican species, and not the same as Panama material. **Ph. medius** Kroeber, misidentified by me in 1943, is treated elsewhere here. The present species is separated from **medius** by the contrastingly pale scutellum and usually more brownish yellow color as well as characters in the key. It is widespread in the lowlands of Panama up to 2000 ft., from Darien to Bocas del Toro and Chiriqui. It has been taken from April to September, with a few specimen at Almirante in January. It attacks man and has been taken in horse-baited stable traps and in light traps, and is probably mainly crepuscular, as specimens have been taken after dark. The range includes Costa Rica and I have seen a specimen from Ecuador which is probably but a variant. Dark specimens resemble **medius**, but have shorter wings, the distance from apex to fork of third vein being 1/4 wing length, while in **medius** this distance is more than 1/4 wing length.

**Philipotabanus (Philipotabanus) pterographicus** (Fairchild)

**Tabanus (Philipotabanus) pterographicus** Fairchild, 1943 (1942), Ann. Ent. Soc. Amer., 35(4): 459, Pl. 2, fig. 15, female, Panama. Wilkerson, 1979, Cespedesia 8(31-32): 331-332, fig. 100.



This species resembles large examples of **Ph. magnificus** Kroeb., differing in pale legs and lack of apical wing infuscation, as well as more reduced wing pattern, which lacks the spike-like darkening extending toward the hind border along veins R5 to Cu1. It averages slightly smaller than **Ph. chrysothrix**, is more grayish, and with more extensive wing pattern, the spot in base of cell 4th R being well developed. Specimens have been taken in Bocas del Toro and Panama provinces, and in several localities on the Pacific side of the Canal Zone all at low elevations, mostly in Shannon traps and horse-baited stable traps. It has been taken once in the forest canopy and once biting a horse at night. All but 2 specimens were taken in the months from Oct. to Feb. Three females from 3 localities in coastal Ecuador are the only non-panamanian specimens I have studied, though Wilkerson (Op. cit.) reports it from Choco, Colombia.

### Subgenus **Mimotabanus** Fairchild

**Mimotabanus** Fairchild 1964, J. Med. Ent., 1(2): 179; 1975, Ann. Ent. Soc. Amer., 68(4): 689-694, 2 plates, key.

The 3 species of this group known from Panama are keyed below. The group ranges from Guatemala to eastern Peru.

1. Mesonotum prominently striped. Wings hyaline with a small dark shade below stigma. Abdomen bluish pruinose with a row of middorsal white triangles .....**plenus** (p. 90)  
 Mesonotum not or faintly striped. Wings with more extensive black markings. Abdomen black with at most a large white patch on fourth tergite .....2
2. Scutellum and adjoining part of mesonotum with bright golden hairs. Wing with basal cells entirely hyaline, dark patch filling whole discal area from ends of basal cells to slightly beyond fork of third vein and from costa to hind margin. Fourth tergite with a broad trapezoid of yellowish white hairs covering segment except for extreme sides .....**inauratus** (p. 89)  
 Scutellum black and black haired. Wings with basal cells 2/3 infuscated, the dark discal patch not extending distally beyond end of discal cell and not reaching hind margin. Pale hairs on fourth tergite forming a rounded triangle 1/3 width of segment .....**phalaropygus** (p. 90)

### **Philipotabanus (Mimotabanus) inauratus** (Fairchild)

**Tabanus (Philipotabanus) inauratus** Fairchild, 1947 (1946), Ann. Ent. Soc. Amer., 39(4): 573-574, Pl. 1, fig. 3, female, Panama.

The species is known from the provinces of Bocas del Toro, Veraguas, Panama and Darien, and the Canal Zone, all at low to moderate elevations in areas of high rainfall. All specimens were taken in Feb. or Mar. save one in July. Two of the 6 female specimens were definitely taken in the forest canopy and 2 others probably were also, all attracted to human bait. The species is known elsewhere only from 1 female from Alajuela, Costa Rica. A recently



collected male, (Barro Colorado Id., C. Z. 3 Mar. 1976, at U.V. light, Silberglied and Aiello colls.) is easily associated with the female on color and pattern. The eyes are holoptic, the upper enlarged eye facets well differentiated and demarcated from the small facets, occupying about half eye area in a triangular patch surrounded by small facets. The enlarged facets are shortly but densely pilose, and there is a small tubercle between the eyes at vertex.

**Philipotabanus (Mimotabanus) plenus (Hine)**

**Tabanus plenus** Hine, 1907, Ohio Nat., 8: 255, female. Izabal Guatemala.

**Stenotabanus (Stenotabanus) plenus:** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 306, fig. 15, female. Panama.

**Philipotabanus (Mimotabanus) plenus:** Fairchild, 1975. Ann. Ent. Soc. Amer., 68(4): 694, Pl. II fig. 5, revision of subgenus.

The species bears a striking resemblance to a large Sarcophagid fly, with reddish bronze eyes in life. The male resembles the female, but the thoracic markings less contrasting. The upper eye facets are enlarged and sharply demarcated from the small facets, occupy 2/3 or more of eye area, and are densely but short pilose. The small facets are bare and extend in a narrow strip to vertex, which bears a small tubercle sunk between the eyes. In Panama the species is scarce but widespread ranging from Cocle prov. (El Valle de Anton) to Darien, and from sea level to 2000 ft. It has been taken in light traps and Shannon traps, and appears to have a limited flight season, Jan. to Apr. in the dry season. Elsewhere it is known from Guatemala and Costa Rica.

**Philipotabanus (Mimotabanus) phalaropygus Fairchild**

**Philipotabanus (Mimotabanus) phalaropygus** Fairchild 1964, J. Med. Ent., 1(2): 177, fig. 11, female, Panama; 1975, Ann. Ent. Soc. Amer. 68(4): 190, Panama to E. Peru. Wilkerson, 1979, Cespedia 8(31-32): 322-333, fig. 107, male, Colombia.

The 2 types were taken in Feb. 1958 in the forest canopy attracted to mosquito collectors, Rio Tuira, Darien prov., while 2 further specimens are from Cerro Quia and Rio Mono, both in Darien. Three specimens from Quincemil, Cuzco, Peru, 2450 ft., Aug. -Sept. 1962, L. Pena coll. seem to be the same. All Panama specimens were taken Feb. or March and at least 2 of them in the forest canopy attracted to human bait. Wilkerson (Op. cit.) describes the male, which has pilose eyes, and notes that his single female from Colombia differed slightly from both Panamanian and eastern Peruvian specimens.

**Subgenus Melasmatabanus Fairchild**

**Melasmatabanus** Fairchild 1964, J. Med. Ent., 1(2): 179. Wilkerson 1979, Cespedia 8(31-32): 318-322.

Only two species of this group, keyed below, occur in Panama; both are rare, and little is known of their habits. The group ranges southwards to Matto



Grosso, Brasil. Both Panama species are largely black insects with a solid black wing pattern, long proboscis, slender palpi, yellow antennae and wholly black legs. Wilkerson (Op. cit.) discusses and figures both Panamanian species.

### Key to Species

- Wing wholly black except for apical third of basal cells and apex beyond fork of third vein .....**fascipennis** (p. 91)  
 Wing with a black patch below stigma which includes whole discal cell but fails to reach hind margin or fork of third vein. Basal cells about half dark basally and axillary cell lightly infuscated .....  
 .....**criton** (p. 91)

### **Philipotabanus (Melasmatabanus) criton** (Kroeber)

**Phaeotabanus columbianus** Kroeber, 1931, Stett. Ent. Zeit., 92: 90-91. Female, Colombia. Not Enderlein 1925.

**Tabanus (Phaeotabanus) criton** Kroeber, 1934, Rev. Ent., 4(3): 304, nom. nov. Fairchild, 1975, Proc. Ent. Soc. Washington 77(2): 260. Type seen.

**Tabanus (Philipotabanus) keenani** Fairchild, 1947 (1946) Ann. Ent. Soc. Amer., 39(4): 574, fig. 2, female, Panama. 1953, Ann. Ent. Soc. Amer., 46(2): 278, male. Colombia.

In addition to the type of **keenani** from Colon prov., the species has been taken in the Canal Zone, at Cerro Azul in Panama prov. and at Rio Tacarcuna in Darien prov., for a total of 8 specimens. These were taken in the months from July to November, two of them in light traps, one each in a house and a horse-baited stable trap, the rest attacking man at ground level. The type of **criton**, now in Warsaw, was recently seen on loan (Fairchild 1975). The male is like the female in color and pattern, with a large area of clearly demarcated and differentiated upper eye facets which are bare. There is no tubercle at vertex. Specimens from Choco and Santander, Colombia and Pichincha Prov., Ecuador have also been seen.

Added to the characters in the key, both basal cells are about half infuscated basally, the mesonotum & scutellum are dark brown, unmarked, the abdomen black with a poorly marked white-haired triangle on fourth tergite. The legs, palpi and proboscis are dark brown to black, but the antennae bright orange yellow.

### **Philipotabanus (Melasmatabanus) fascipennis** (Macquart)

**Tabanus fascipennis** Macquart, 1845, Dipt. Exot. Suppl. 1: 35, Pl. 4, fig. 1, female. "Nouvelle Grenade" (Colombia).

**Tabanus (Philipotabanus) fascipennis**: Fairchild, (1942) 1943, Ann. Ent. Soc. Amer., 35(4): 462, fig. 19, female. Panama.

**Philipotabanus fascipennis**: Fairchild, 1958, Ann. Ent. Soc. Amer., 51(6): 529, full references.



The two examples seen from Panama came from the mountains east of the Canal Zone (La Zumbadora, Cerro Azul, Panama prov., 4 Feb. 1957 and 17 Dec. 1965) taken by mosquito collectors in the forest canopy. I have seen other material from Venezuela and Muzo, Colombia. In fresh specimens the eyes are bright green, unbanded, the thorax brownish with faint coppery hair stripes, a small white-haired triangle on fourth tergite, and the black wing areas with metallic blue reflections. Wilkerson (1979) discusses Colombian material, describes the male, which has pilose eyes, and figures the wing.

Genus **Stypommisa** Enderlein

Enderlein 1923, Deuts. Ent. Zeits., p. 545; 1925, Mitt. Mus. Zool. Berlin, 11(2): 369. Kroeber, 1934, Rev. Ent., 4(2): 276, references.  
**Stictotabanus** Lutz 1914, nomen nudum. Fairchild, 1961, Mem. Inst. Osw. Cruz, 59(2): 244.  
**Stenotabanus**: Fairchild, 1942, Ann. Ent.Soc. Amer., 35(3): 297, in part.

This genus is separated from **Stenotabanus** by having a few setae on the basicosta, the eyes with a single dark stripe, bicolored, or unicolorous, and the frontal callus nearly always narrower than frons and generally prolonged upwards in a narrow ridge. The included species are generally small flies, seldom over 12 mm. in wing length, usually with spotted or tinted wings and narrow frons. They are structurally quite similar to **Leucotabanus**, but have much fewer setae on basicosta and a different style of coloration. They seem to be close to what would be expected of a link between primitive Diachlorini and primitive Tabanini, and could be placed in either group. The sparse setae on basicosta and well developed tubercle at vertex suggest Diachlorini, the other characters are Tabanine or shared by both groups. The group is not very homogeneous in appearance, and may well prove to be polyphyletic on further study.

The Panama species are all inhabitants of heavy forest in areas of high rainfall, two are quite strictly arboreal and one of these is strongly mimetic. All attack man readily.

Key to females

- 1.      Wings glass clear. Frons less than 3 times as high as basal width, the callus broadly drop-shaped. All tibiae bicolored, basally pale. Abdomen dark brown with a series of contiguous middorsal triangles and posterior margins of all tergites grey .....**serena** (p. 97)  
      Wings tinted or cross veins clouded or spotted. Frons over 4 times as high as basal width .....2
- 2.      Fork of third vein without appendix.....3  
      Fork of third vein always with an appendix which is rarely shorter than the adjacent vein segment .....5
- 3.      Legs entirely black, black-haired. Mesonotum prominently bluish white striped. Abdomen with at least first 2 tergites bluish pruinose, and tergites 2 to 6 with small middorsal triangles and posterior lateral margins white haired .....**maruccii** (p. 96)



- Legs brown, at least in part, the tibiae at least partly pale-haired.  
 Mesonotum at most weakly striped .....4
4. Brownish species, the mesonotum weakly striped, the abdomen without prominent bluish pruinosity, but with pale hind margins and large pale-haired median triangles on all tergites ..... **jaculator** (p. 95)  
 Black species, the mesonotum unstriped, the abdomen black, weakly bluish pruinose anteriorly, but without median triangles or pale posterior bands ..... **hypographa** (p. 95)
- 5.(3') Wings with large prominent dark clouds on all crossveins and narrow pale pilose bands on hind margins of all abdominal tergites ..... 6  
 Wings at most with small faint clouds on fork and distal end of discal cell .....7
6. Brown species, the thorax and abdomen nearly concolorous, the scutellum with at least apex reddish. Second abdominal tergite with a large but diffuse blackish integumental median spot. Frons slightly broader (index 4.75). Abdominal pale pilose hind marginal bands prominent, underlain by slightly paler broad integumental bands .....  
 ..... **lerida** (p. 96)  
 Mesonotum and scutellum black in ground color, the paler brown abdomen contrasting. Second abdominal tergite without dark median spot. Frons narrow (index 5.97). Abdominal pale pilose bands very narrow, often not evident in worn specimens, not underlain by paler integument ..... **changena** (p. 94)
7. Wings with small to moderate clouds on crossveins and fork; marginal and submarginal cells strongly brown tinted. Abdomen largely black-haired, at most with small median pale-haired triangles. Smaller species, generally less than 11 mm. in wing length .....  
 ..... **pequeniensis** (p. 97)  
 Wings without, or with very small and faint clouds on fork and crossveins. Whole wing yellowish, sometimes brownish in marginal and submarginal cells. Abdomen with broad yellow haired bands on all tergites. Larger species, generally over 12 mm. in wing length .  
 ..... **captiroptera** (p. 93)

### **Stypommisa captiroptera** (Kroeber)

**Tabanus (Macrocormus) captiropterus** Kroeber, 1930, Zool. Anz., 78(1-2): 10, fig. 8, female, Venezuela.

**Stenotabanus xenium** Fairchild, 1947, Ann. Ent. Soc. Amer., (1946) 39(4): 568, Pl. 1, fig. 5, female, Panama.

**Stypommisa captiroptera**: Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 81, synonymy.

This species is generally larger than **pequeniensis**, as well as differing as detailed under that species. It is neither so abundant nor widespread in Panama as **pequeniensis**, occurring in Bocas del Toro Prov., (Nigua Creek, near Almirante and our Yellow Fever Station), at Rio Pequeni on Madden Lake, Rio Mandinga, Colon Prov., and Rio Canita, in the Rio Bayano valley. All localities are at low



elevations in areas of high rainfall. Several specimens were taken at night, and most material was from Shannon traps. There appears to be no special flight season, as specimens have been taken in Jan., May, June, July and Aug. The species ranges from Nicaragua south to the mouth of the Amazon and eastern Peru.

***Stypommisa changena* Fairchild n. sp.**

A moderate sized dull brown species with wings both spotted and the veins brown-margined, and the abdominal tergites with obscure pale hind margins or small median pilose triangles.

Female. This species is best described by comparison with *St. lerida*. It is a more slender species and the overall coloration is darker. The scutellum is dark blackish brown, (with at least the apex usually red in *lerida*). The frons is slightly narrower in *changena*, the maximum, minimum, median and mean indices of eight specimens being 6.25, 5.30, 5.78 and 5.97, while for seven specimens of *lerida* the corresponding figures are 5.3, 4.5, 4.85, and 4.75. The indices of divergence (frontal width at vertex divided by frontal width at base) are not significantly different, ranging from 1.1 to 1.5 in both species. The wings of *changena* have the appendix usually longer than the subtending vein segment due to shortness of the latter, while in *lerida* the vein segment is often longer than the appendix. The wings in *changena* have a noticeable anteroapical brown tinting and all the veins are narrowly brown margined. In *lerida* the wing is lightly and evenly tinted without noticeable darkening apically and the veins not obviously brown margined. *Lerida* has a prominent but diffuse median blackish integumental spot on abdominal tergite 2, wholly lacking in *changena*, where the abdomen is uniformly dark brown. *Changena* has but faint traces of pale hair fringes on the tergites, while these are prominent in *lerida*. The two species have different times of flight, February, March and April for *lerida*, May to November for *changena*. The eyes of both species are green with a single purplish transverse stripe.

Male. Color and wing pattern as in the female. Eyes with enlarged upper facets bare, well differentiated from small facets, but without a sharp line of demarcation, the larger facets occupying about 2/3 to 1/2 total eye area. Small facets extend in a narrow band to vertex behind and there is a small tubercle sunk to eye level at vertex with vestige of at least the anterior ocellus. The occiput bears a sparse fringe of long forwardly directed dark hairs.

Holotype female, Panama, Rio Changena, Bocas del Toro prov., 2400 ft. elev., 26 Sept. 1961.

Allotype male, Panama, Chiriqui prov., La Fortuna, 10-VI-1977, U.V. light trap, H. Wolda coll.

Paratypes, 4 males, 67 females, as follows: Panama: 2 females, same data as holotype; 3 males, 9 females, same locality and collector as allotype, IV,V,VI,VII,VIII-1977, U.V. light trap; 42 females, Yellow Fever Camp, same locality as holotype, human bait and Shannon trap, VIII-IX-1961; 3 females, Rio Claro-Rio Changena, Bocas del Toro prov., 910 m elev., 20-21-V-1966, C. Myers coll.; 3 females Rio Uri, Changuinola, Bocas del Toro prov., VIII-IX-1968, R. Hartmann coll.; 1 female, Boquete, Chiriqui prov., no date or collector; 1 female, Robalo trail, Bocas del Toro prov., 6500 ft. elev., 6-VIII-47; 1 female Calderas-Chiriquicito trail, Chiriqui prov., 600-1400 ft. elev., in treetops, 26-X to 5-XI-55. Costa Rica: 1 female Cartago prov., Hacienda de Moravia de



Chirripo, 7-10-VII-1964, McDiarmid coll.; 1 male, 2 females, Puntarenas prov., Monteverde area, 6-14-VI-73 and 21-V-76; 1 female, Alajuela prov., Chomogo area, 1620 m. elev., 13-VI-73; 1 female, Carillo, no date, C. F. Underwood coll. In addition, I have seen 1 female in C.A.S. from Heredia, Costa Rica, 19-20-VII-75, Fisher coll., and 27 females in Univ. California, Berkeley from Monteverde area, Puntarenas prov., Costa Rica.

Holotype, allotype and some paratypes to be deposited in F.S.C.A., other paratypes in L.A.C.M., M.C.Z., U.C. Berkeley, and collections of L.L. Pechuman, and the author.

### ***Stypommisa hypographa* (Kroeber)**

***Stypommisa hypographa*** Kroeber, 1930, Zool. Anz., 86: 252-253, female, Venezuela, Bolivia, Peru.

***Stypommisa hypographa***: Fairchild, 1967, Stud. Ent. 9(1-4): 359, fig. 32(1966). Philip, 1969, Acta Zool. Lilloana, Tucuman, 22: 124(1967).

Two specimens of what seems to be a form of this species were taken by R. L. Dressler at Cerro Jefe, Panama Prov., 28 April and 8 May 1968. They differ from my notes on the type in having the wings less strongly spotted, lacking the clouds at tip of anal cell and tips of median veins. The tibiae have a few silvery hairs at base on all legs, most abundant on fore pair which are obscurely bicolored. One specimen has the third antennal plate quite dusky, hardly contrasting with style, in the other it is dark orange, though not so brightly contrasting with black style as in ssp. ***neofurva*** Philip. Two specimens of the latter from Bolivia, Mapiri, S. Carlos, 800 m. 9 Jan., 03 have wings intermediate between the Panama specimens and my figure of the type of ***hypographa***. The legs are browner in these, with but traces of silvery hairs on the fore tibiae only in one. Kroeber describes the antennal plate as black, though the Venezuelan type lacked antennae, so that his statement must refer to Bolivian and/or Peruvian specimens, as may the remainder of his description, at least in part. I believe that color of antennal plate is variable, and that the Bolivian and Peruvian specimens discussed by Kroeber and Philip and my Panamanian specimens are but variants of a single species. Whether they are specifically or subspecifically distinct from Venezuelan material cannot be decided on present evidence.

These Panama specimens closely resemble ***St. maruccii*** Fchld. but differ in lacking mesonotal grey stripes, in having a wholly black abdomen without mid-dorsal pale triangles and with only a trace of bluish pruinosity on first tergite, the wings more heavily fumose in marginal and submarginal cells, and the frons slightly narrower with more slender tapered callus. Though both ***maruccii*** and ***hypographa*** have been taken in the Cerro Jefe-Cerro Azul area, there seems to be a seasonal separation at least in that locality, with ***maruccii*** occurring in Sept. - Dec., ***hypographa*** in April - May.

### ***Stypommisa jaculator* (Fairchild)**

***Stenotabanus jaculator*** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 309, fig. 9, female, Panama; 1951, Op. cit., 44(3): 452-453, male.

***Stypommisa jaculator***: Barretto, 1957, Rev. Brasil, Malar., 8(1): 82 (1956), Br. Guiana.



This is a rather inconspicuous little fly, dusty cocoa-colored, the weakly spotted wings with the fore borders tinted brownish. In well preserved examples, there is a series of broad sparsely white-haired triangles arising from the sparsely white-haired hind borders of the abdominal tergites. The eyes are bronzy green in life, with a narrow and often inconspicuous dark median transverse line. The male is similar, the upper eye facets markedly enlarged but not demarcated from the small facets by an abrupt change in facet size.

The species is abundant at about 2000 ft. on Cerro Azul, Panama Prov., where it was taken at human bait in the forest canopy and in a light trap. Elsewhere it has been taken in the canopy and at ground level at several localities in the Canal Zone in stable traps and light traps, in Darien Prov. from near sea level to 4000 ft., at Cerro Campana, Panama Prov., 3000 ft., and at El Valle, Coclé Prov. The flight season is short. March to May, with one June record. I have seen the specimen recorded by Barretto from British Guiana, and more recently the species was taken at Teresita and Curiche river in the Dept. Chocó, Colombia by personnel of the Office of Interoceanic Canal Studies. The species is separable with difficulty from *St. prunicolor* (Lutz), from Brazil, which has the antennae wholly orange yellow, while *jaculator* seems always to have at least the terminal annulus of style black, generally the style all black.

#### ***Stypommisa lerida* (Fairchild)**

***Stenotabanus lerida*** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 307-308, Pl. 1, fig. 14. Female, Panama; 1947, Ann. Ent. Soc. Amer., (1946), 39(4): 568.

***Lerida*** differs from ***changena*** as detailed in the key and in the description of the latter, but seems to be a much rarer species. All specimens seen (23 females) have been taken on the Pacific slope of Volcan Bauru in Chiriquí province above Boquete, at Cerro Punta and at Cerro Pando. Time of flight seems short, as all were collected in Feb., March and April in various years. Conversely, most specimens of ***changena*** were taken in the rainy season from May to Oct., and except for an undated specimen from Boquete, and a long series from Fortuna, on the northern side of the Volcan in Bocas del Toro province. The specimens reported as ***lerida*** by Hogue and Fairchild (1974) from Costa Rica are ***changena*** on further study.

#### ***Stypommisa maruccii* (Fairchild)**

***Stenotabanus maruccii*** Fairchild, 1947, Ann. Ent. Soc. Amer., 39(4): 568, fig. 8 (1946) female, San Blas, Panama; 1958, Ann. Ent. Soc. Amer., 51(6): 529, synonymy.

***Stenotabanus frondicolus*** Fairchild, 1951, Ann. Ent. Soc. Amer., 44(3): 453-454, fig. 5, female, Chiriquí, Panama; 1953, Proc. Ent. Soc. Wash., 55(5): 241.

This little species bears a close resemblance to a Sarcophagid fly, the eyes in life being bright brick red, with a narrow transverse green stripe, fading to green with a dark stripe shortly after death. The thorax bears prominent pale stripes and the abdomen is extensively bluish-grey pruinose, with a median row



of small pale-haired triangles. The wings bear small clouds on crossveins and fork, and are lightly tinted along the apical half of anterior margin.

In Panama, the species is found in areas of high rainfall and heavy forest up to elevations of at least 3000 ft., from Darien to Chiriqui and Bocas del Toro Provinces. It is highly arboreal, being seldom taken at ground level, and appears to be on the wing throughout the year. Practically all our material has been taken with human bait. The range includes Nicaragua (Villa Somoza, 7 July 1953, in forest canopy) and Colombia (Rio Raposo, nr. Buenaventura, cited in Lee, Fairchild and Barreto, 1969).

### ***Stypommisa pequeniensis* (Fairchild)**

***Stenotabanus pequeniensis*** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(3): 308-309, fig. 13, female, Panama.

***Stenotabanus pequiensis***: Philip, (lapsus) 1960, Proc. Calif. Acad. Sci., Ser. 4, 31(3): 77, Peru.

***Pequeniensis*** is quite variable in intensity of coloring and in proportions of frons, the latter varying from 6 to 7 times as high as basal width. Certain pale specimens, especially if the abdomen is denuded, are difficult to separate with certainty from ***captiroptera***. ***Pequeniensis*** generally has distinct though small spots on crossveins and fork, and the apical wing infuscation is heavier and ceases rather abruptly at the level of the tip of the stigma. The antennal style, and sometimes the apex of the plate, are nearly always blackish. In ***captiroptera*** fork and crossveins rarely have perceptible clouds, the apical wing infuscation is lighter, browner, and is not abruptly limited basally. The antennal style is usually all yellow, or with only the apical one or two annuli blackish. ***Pequeniensis*** usually has the pleura white or gray pilose, yellow in ***captiroptera***.

Panama material has all come from heavily forested areas of high rainfall, either on the Atlantic coast or from the mountains at elevations up to 5000 ft. Records are from Darien, Panama, Colon and Bocas del Toro provinces. Most specimens were taken in May, lesser numbers from June to September. The species attacks man readily at ground level and is taken in Shannon traps. The eyes are bright green in life, unbanded.

The male is colored like the female, the head wider than thorax with the upper enlarged eye facets occupying about two-thirds of the eye area, strongly differentiated and sharply demarcated from the small facets. In life the upper facets are bronze, the lower green with purple reflections. There is a small tubercle at vertex between eyes.

The species ranges from Costa Rica south to Colombia, Ecuador and eastern Peru.

### ***Stypommisa serena* (Kroeber)**

***Tabanus serenus*** Kroeber, 1931, Stett. Ent. Zeit., 92: 304, female, Venezuela. Type in Vienna seen.

***Stenotabanus vapidus*** Fairchild, 1964, J. Med. Ent., 1(2): 172-174, fig. 10, female, Panama.

This species should be recognizable from the characters in the key. It is placed in this genus with some hesitation, as the frons is unusually broad and



the wings and color pattern of abdomen rather different from other species. The callus is large and rounded, the upper extension thread-like, while the antennal plate is broad with a strong dorsal angle. Aside from the type from Venezuela, the species has been taken at Rio Tuira in Darien Prov., and from Muzo, Colombia, and Tingo Maria, Peru. All localities are in the areas of high rainfall, and all except the Rio Tuira specimen from altitudes of over 1500 feet.

### Genus *Leucotabanus* Lutz

Lutz 1913, *Brasil Medico*, 27, No. 45, p. 487. Fairchild, 1941, *Ann. Ent. Soc. Amer.*, 34(3): 629-631, references, key; 1953, *Ann. Ent. Soc. Amer.*, 46(2): 274-276, key; in press, *Myia* vol. 3.

This genus contains 17 described species, of which 5 have been taken in Panama. All the Panama species are basically black with the thorax or at least the scutellum nearly always with contrasting white or yellow hairs, and the wings clear or slightly tinted. The frons is generally rather narrow with a club-shaped or ridge-like callus and a definite tubercle at vertex. The basal plate of third antennal segment is moderately broad, with a fairly strong dorsal angle. Three of the species tend to have the abdomen more or less acutely pointed, and all have bare unicolorous greenish-black eyes in life. The known males have the upper eye facets greatly enlarged, clearly demarcated from the small facets, the head wider than thorax, and a tubercle at vertex.

### Key to females

1. Legs entirely black. Abdomen with at most a narrow band of white hairs on hind margin of fourth tergite and sides of second. Costal cell strongly brown tinted. Subcallus centrally bare and shiny ..... 2  
 Legs with all tibiae at least one third basally white. Abdomen with at least second and fourth tergites with white hair. Costal cell not darker than rest of wing. Subcallus pollinose ..... 3
2. Mesonotum and scutellum entirely clothed with bright yellow pollen and hairs. Abdomen above entirely black ..... **flavinotum** (p. 100)  
 Mesonotum predominantly black haired, scutellum with black or dark yellow hairs. Extreme sides of second and entire hind border of fourth tergites with white hairs ..... **aurarius** (p. 99)
3. Antennae yellowish brown, the style much longer than basal plate. Whole insect, with exception of notopleural lobes, blackish in ground color, grey pollinose. All abdominal tergites usually with some white hairs, more extensive on second and fourth tergites .....  
 ..... **nigriventris** (p. 99)  
 Antennae black or very dark brown. At least scutellum pale in ground color, pollinosity of thorax and abdomen brown to black ..... 4
4. Second tergite with a median and lateral white hair patches, usually separated, sometimes narrowly joined. Fourth tergite more than two thirds white, the band widest in middle and sides. Remaining tergites entirely dark. Antennae black, strongly excavated dorsally, the



basal angle prominent, the basal plate shorter or equal to style. Frons about 4.5 times as high as basal width, the callus much narrower, drop-shaped, brown or yellow. Palpi yellow or brown, black or partly white-haired. Abdomen not pointed at tip .....

.....**canithorax** (p. 100)

Second tergite narrowly white-haired behind, widened in middle and sides. Fourth tergite at most half white. Third, fifth and sixth tergites often with narrow white hind borders or median white triangles. Antennae less strongly excavated, the basal plate longer than style. Frons about 5.5 times as high as basal width, the callus proportionally wider, black. Palpi black and black haired. Abdomen usually sharply pointed ..... **exaestuans** (p. 100)

### **Leucotabanus aurarius** Fairchild

**Leucotabanus aurarius** Fairchild 1953, Ann. Ent. Soc. Amer., 46(2): 274, Pl. 2, fig. 12, female, Panama.

Aside from the Holotype, only 3 other specimens have been taken, at Almirante, Bocas Del Toro prov., one 11 July 1960 and two 7 Aug. 1963. The 1960 specimen differs from the others in entirely lacking yellow hairs on scutellum and sides of mesonotum, the whole insect being black except for the white-haired sides of tergite 2, hind margin of 4, and white haired sternites 2 and 4. The type was taken in a Shannon trap, and the others probably also, although not so labelled.

### **Leucotabanus nigriventris** Kroeber

**Leucotabanus nigriventris** Kroeber 1931, Stett. Ent. Zeit., 92: 92, female, Chiapas, Mexico. Fairchild, 1941, Ann. Ent. Soc. amer., 34(3): 637, fig. 8, references and synonymy; 1975, Proc. Ent. Soc. Washington, 77(2): 260.

A single badly denuded specimen from Nigua Creek, Almirante, Bocas del Toro Prov., July, 1962, in light trap, agrees with a specimen from Tabasco, Mexico, determined as this species and with the types on loan from Warsaw. **Nigriventris** is very similar in structure to **L. ambiguus** Stone from Arizona, but differs in more evenly ridge-like callus, blunter palpi, pale antennae, and black unicolorous ground color of mesonotum. My figure of this species (1941) was drawn from a Guatemalan specimen determined by Hine as **albiscutellatus** Macq., a misdetermination, as noted by Stone (1938) when he described the Arizona specimens as **ambiguus**. The palpi of the Tabasco and Panama specimens are more slender, but still blunt tipped. Though almost entirely denuded of its pilosity, the Panama specimen is deep black in ground color, entirely steel grey pollinose.



**Leucotabanus canithorax** Fairchild

**Leucotabanus canithorax** Fairchild 1941, Ann. Ent. Soc. Amer., 34(3): 634-636, fig. 5, female, Panama; 1953, op. cit., 46(2): 275, in key only; 1956, Smiths. Miscell. Colls., 131(3): 10.

The species is rare in Panama, having been taken only in Darien prov., Rio Tuira, 24 Feb. 1958, and at Moja Pollo on the Rio Chagres above Gamboa, Jan. - May, 1940-1941. Specimens were taken biting domestic animals or in a Shannon trap. I have seen females from British Honduras (Belize) and British Guiana (Guyana), and a male from Trinidad. The latter is badly crushed, but resembles the female, except that the white bands on abdomen are broader, that on second tergite covering the whole segment. The figures for **canithorax** and **leuconotum** in my paper (1941) are mislabelled. Fig. 4 is **leuconotum**, fig. 5 **canithorax**, the reverse of the numbers on the plate.

Although originally proposed as a replacement name for **T. albicans** Macq. 1845, not Macq. 1835 and 1838, the name was accompanied by a description of specimens, and is thus not invalidated by my subsequent (1956) discovery that **albicans** Macq. 1845=**exaestuans** Linn. 1767.

**Leucotabanus exaestuans** (Linnaeus)

**Tabanus exaestuans** Linnaeus, 1767, Syst. Nat. Ed. 12, 1, pt. 2, p. 1000, Amer. Merid. Philip, 1952, Ann. Ent. soc. Amer., 45: 312, type seen.

**Leucotabanus exaestuans**: Philip, 1960, Proc. Calif. Acad. Sci., Ser. 4, 31(3): 91, Peru. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 108, figs. 14, 28.

**Leucotabanus leucaspis** (Wied.): Fairchild, 1941, Ann. Ent. Soc. Amer., 34(3): 632-634, fig. 7, female, Panama, full references and synonymy; 1942, Op. cit., 35(1): 88, seasonal distribution; 1953, Op. cit., 45(2): 275, in key.

The species occurs throughout Panama at lower elevations, and seems to fly throughout the year. It rarely attacks man but bites cattle and horses readily, and is thus frequently taken in animal-baited stable traps. These have not been used much outside the Canal Zone area, so that the species is probably more abundant than our records indicate. Males have been taken in light traps, and the species reared from larvae taken with those of **L. flavinotum** (Goodwin and Murdoch 1974). The range appears to cover the whole Neotropics, from Mexico to Argentina, but not in the West Indies.

The color varies considerably. Some specimens have the mesonotum almost wholly white-haired, others with the disk dark and white hairs only on the margins and scutellum. The abdomen always has white bands on second and fourth tergites, usually on fifth and sixth, and occasionally some white on third. The pale hairs of thorax are generally white, less often with a more or less pronounced yellowish tinge.

**Leucotabanus flavinotum** (Kroeber)

**Tabanus flavinotum** Kroeber, 1934, Rev. Ent. 4(3): 309, new name for **Tabanus nigriflavus** Kroeber, 1931, nec. Kroeber 1930.



**Leucotabanus flavinotum:** Fairchild, 1941, Ann. Ent. soc. Amer., 34(3): 632, fig. 1, female, Panama, references; 1956, Smiths. Miscell. Colls. 131(3): 16, type seen; Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 108 figs. 15, 29.

This vivid little species hardly ever exceeds 10 mm. in length. The combination of bright lemon yellow thorax and black abdomen is unmistakable. In much denuded specimens, the thorax is pale yellowish grey. The species seldom attacks man, but enters stable traps and Shannon traps and attacks horses and cattle readily. It has been taken in small numbers in Darien, Panama, Colon and Bocas del Toro Provinces, and on both coasts of the Canal Zone, rarely at elevations over 1000 ft. A considerable series of both sexes was reared from larvae taken from mixed earth and rotten wood in the base of a hollow tree containing bats on the rio Cocoli, Canal Zone. The larvae were of much the same size and all pupated and yielded adults within a few days of 1 May, 1956. Most of the captured specimens were also taken in May, with scattered specimens in March, April, June and July. The male differs only in sexual characters and more slender antennae. The species is known from Costa Rica to Amazonas, Brazil. Goodwin and Murdoch (1974) described the larva and pupa, finding them in situations similar to those reported above, nearly always associated with rotten wood. It is noteworthy that Burger (1977) found larvae of *L. ambiguus* Stone in rot holes in trees in Arizona, while larvae of the other Nearctic species, *L. annulatus* (Say), are always found associated with rotten wood or in rot holes in living trees.

#### Genus *Lepiselaga* Macquart

Macquart 1838, Dipt. Exot., 1(1): 153. Kroeber, 1929, Encycl. Ent. Ser. B, 2, Dipt. 5: 136. Fairchild, 1966, Psyche, 72(3): 210-217, fig. 5 (1965), key. Coscaron, 1968, Rev. Soc. Ent. Argent., 30(1-4): 51-59, figs.

But one species of this small genus occurs in Panama, the widespread *L. crassipes*; the other species occur in Colombia, southern Brasil and Argentina.

#### *Lepiselaga crassipes* (Fabricius)

*Haematopota crassipes* Fabricius, 1805, Syst. Antl., p. 108, no sex, South America.

***Lepiselaga crassipes*:** Fairchild, 1940 Psyche 47(1): 8-13, figs. 1-5, early stages; 1942, Ann. Ent. Soc. Amer., 35(3): 291, fig. 2, full references. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 106, figs. 22, 29. Wilkerson, 1979, Cespedia 8(31-32): 351-353, figs 113, 114.

In addition to the characters in the key, the species has a wholly black and shiny face and shiny subcallus, flattened shiny palpi, all tibiae black and inflated, all tarsi white. The black parts of the wing have several small round hyaline fenestra, and the base of M3, forming the posterior border of the discal cell, is bent strongly forward, so that the discal cell is constricted in the middle.

In Panama the species is common to abundant in the vicinity of swamps, lakes and large rivers. the larvae live in floating aquatic vegetation, such as water lettuce and water hyacinth. the adults attack man persistently



especially about the legs, and may be severe pests. They are known locally as "Congo". In the period shortly after the filling of Gatun Lake, large areas of the lake became covered with water lettuce, and this insect became exceedingly abundant. As conditions stabilized, the water lettuce disappeared except for small patches, and the Congo fly is now only occasionally troublesome. Goodwin and Murdoch (1974) have re-described the larva and pupa.

The range includes most of the Neotropics, from Southern Mexico and the Greater Antilles, south to Paraguay and northern Argentina. Specimens have been taken from aircraft landing in Miami, Florida from various Neotropical countries.

## SUBFAMILY TABANINAE

### Tribe Tabanini

Flies belonging to this tribe, in addition to the characters given in the key, are generally without pictured wings or inflated legs or antennal segments. They always lack sclerotized labella or vestiges of ocelli, and only a few species have long dorsal spines dorsally on the antennae. All but one of those occurring in Panama belong in the Genus *Tabanus*, an enormous world-wide group of possibly polyphyletic origin.

### Genus *Poeciloderas* Lutz

Lutz 1921, Bol. Inst. Osw. Cruz, 1(1): 15. Fairchild, 1969, Arq. Zool. S. Paulo, 17(4): 220; 1971, Cat. Dipt. S. Amer., 28: 85, synonymy.

This genus is characterized by having a small tubercle at vertex, eyes generally pilose in female, densely so in male, inflated antennal scapes, and wings with first posterior cell closed or strongly coarctate. Most of the species are south temperate or Andean, but the single Panamanian species ranges from Mexico to Argentina. It has been included in the key to *Tabanus*, as it may easily be mistaken for a species of that genus.

### *Poeciloderas quadripunctatus* (Fabricius)

*Tabanus quadripunctatus* Fabricius, 1805, Syst. Antliat., p. 99.

*Tabanus (Hybomitra) quadripunctatus*: Fairchild, 1942, 35(4): 452-453, fig. 8 (full references).

*Poeciloderas quadripunctatus*: Fairchild, 1971 Cat. S. Am. Dipt., Fasc. 82, p. 86, synonymy. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 116 fig. 36. Wilkerson, 1979, Cespedia 8(31-32): 356-358, fig. 115. Coscaron and Fairchild, 1976, Physis, Sec. C. 35 (91): 294, fig. 1

This species is easily recognized by the combination of spotted wings, white median figure on the second abdominal tergite and pilose eyes. It is uncommon but widespread, apparently throughout Panama. The eyes of the female in life are purplish black with 2 green transverse bands, while in the male the upper



green band is covered by the area of slightly enlarged facets except at its outer end. Females have been taken in horse-baited mosquito stable traps and Shannon traps, males hovering and at light. The variety *amabilinis* Philip, with extensively white second tergite seems to be less common than the type, but has been taken in the same localities. Males have been taken hovering in the early morning a few feet above ground level. It appears to fly throughout the year. Goodwin and Murdoch (1974) described a male pupa from Chiriqui province.

### Genus *Tabanus* Linnaeus

Linnaeus 1758, Syst. Nat. Ed. 10. 1: 601. Fairchild, 1971 Cat. S. Am. Dipt. Fasc. 28 p. 87, synonymy.

This genus includes 38 Panamanian taxa, and is hence the largest genus occurring in the country. Efforts to split the group into subgenera have not met with wide acceptance (Fairchild 1969) and subgenera are not used here. The key is frankly artificial and based on easily seen characters. Difficulty may arise in determining members of a group of small similar appearing species found in mangrove swamps whose abdomens are faintly striped in well preserved specimens, but apparently unicolorous when worn or denuded, as they often are. The species are *nondescriptus* (couplet 29) and *nereus* and *rhizophorae* (couplet 40). Specimens running to any of these species should be checked with the text and with Fairchild (1973). *Tabanus pungens* apparently contradicts the definition of the genus given in 1969 (Fairchild l. c.) having a well-marked tubercle at vertex. The eyes in both sexes are bare, however, and there seems no point in erecting a separate category for it at this time. Males of about 2/3 of the species are known, but since most of them will key out easily with the females, they are not keyed separately. Notes on those that are known are given under each species. The species are treated alphabetically for ease of reference.

### Key to Females

1. Eyes of female generally with some short pilosity, those of male densely pilose. Vertex with a round or oval low tubercle. Wings with first posterior cell strongly coarctate or closed at or before wing margin, and with all crossveins with strong dark clouds. First antennal segment strongly produced dorsally, forming a hood over the second segment ..... *Poeciloderas quadripunctatus* (p. 102)  
Without the above combination of characters (If a tubercle at vertex is present but wings unspotted see couplet 28) .....2
2. A prominent black velvety pilose spot covering base of scutellum and adjoining border of mesonotum, usually bordered with paler hairs and pollinosity .....3  
Without such a prominent spot, though sometimes with a small velvety spot on posterior border of mesonotum .....9
3. With a long appendix at fork of third vein..... 4  
Without an appendix at fork of third vein..... 7



4. First posterior cell always closed and petiolate. All crossveins and fork with small, often faint, clouds. Eyes with 2 bands and lower margin green, the bands as wide as the dark interval between them .....  
 .....**oculus** (p. 118)  
 First posterior cell rarely closed, never petiolate and crossveins and fork without clouds .....5
5. Eyes with 2 narrow green bands, much narrower than the dark interval between them, the lower margin sometimes narrowly green. Mid abdominal pale triangles equilateral or higher than wide, the posterior borders of tergites without pale hairs .....**pseudoculus** (p. 122)  
 Eyes with 3 broad green bands, the upper 2 sometimes confluent at outer ends, the lower margin of eye always dark. Mid abdominal triangles broader than high, the posterior borders of tergites paler and pale-haired .....6
6. Black species with femora largely black .....**albocirculus** (p. 109)  
 Reddish species with femora largely pale .....**albocirculus** var. (p. 109)
- 7(3). Abdomen unicolorous, dark brown, wholly black-haired. Frontal callus a slender ridge, hardly widened below. Large species with dark brown wings and almost wholly black legs .....**defilippii** (p. 112)  
 Abdomen with at least vestiges of pale-haired mid-dorsal triangles. Frontal callus definitely widened below .....8
8. Large stout species. Antennal plate orange, not unusually slender. All femora orange. Abdomen dark reddish brown, black-haired, with small and often faint orange-haired median triangles. Eyes in life bicolored .....**polyphemus** (p. 119)  
 Smaller slender species. Antennal plate black, unusually long and slender. At least fore femora blackish, generally darker than the others. Abdomen yellowish brown, brown haired, with faint slightly paler-haired middorsal triangles which are sometimes contiguous, forming a stripe. Eyes in life unicolorous, bronzy .....  
 .....**unipunctatus** (p. 128)
- 9(2). With a more or less prominent black velvety spot on posterior margin of mesonotum .....10  
 Without such a spot .....14
10. Abdomen without noticeable pattern, essentially unicolorous .....11  
 Abdomen with a pattern due to contrasting vestiture or underlying color or both .....12
11. Abdomen pale green or straw colored, wholly yellow-haired. Mesonotum gray, largely pale-haired. Wings glass-clear, or the veins slightly brown-margined. Basal plate of third antennal segment with a moderate acute dorsal angle .....**olivaceiventris** (p. 118)  
 Abdomen nearly black, bluish pruinose, black haired. Mesonotum dark reddish brown, sparsely orange haired. Wings strongly brown tinted, the veins broadly brown margined. Basal plate with a long dorsal spine .....**punctipleura** (p. 123)



12. Fork of third vein with a long appendix. Abdomen unicolorous brown with a middorsal row of white-haired triangles. Slender species with velvety black spot often faint ..... **rubripes** (p. 125)  
No appendix at fork. Abdomen otherwise. Velvety black spot prominent.. ..... 13
13. Palpi unusually short and inflated. Abdomen yellowish brown in ground color, often with an indistinct dark median stripe. Vestiture consisting of median black-haired triangles and dark lateral margins, between which is a pair of broad dorsolateral orange-haired stripes or series of more or less connected spots. Wings generally with a small dark area below stigma and clouds around basal crossveins and fork of third vein ..... **importunus** (p. 113)  
Palpi inflated basally, but with drawn-out slender apex. Abdomen as above, though generally more reddish, but with a middorsal row of pale-haired triangles superimposed on the dark-haired median stripe. Wings with clouds around crossveins and fork, but without the sub-stigmatic dark patch ..... **nebulosus** (p. 115)
- 14(9). Large, wholly black species with deeply fumose to black wings ..... 15  
Otherwise colored or small species ..... 16
15. Frontal callus slender, ridge-like. Basal plate of third antennal segment with a low but acute dorsal angle. Wings dark brown .....  
..... **morbosus ebeneus** (p. 115)  
Frontal callus oval below, extending in a ridge above. Basal plate with a long slender curved dorsal spine. Wings deep black .....  
..... **erebus** (p. 113)
16. Large black species with white striped mesonotum, white-haired scutellum, abdomen with large median white patch on tergite 4 and smaller white spots on tergites 1,2,5, and 6. Wings with all crossveins and fork with large dark clouds, and base and apex infuscated ..... **xenorhynchus** (p. 129)  
Not as above, the wings not heavily spotted ..... 17
17. Large brown species with reddish or orange brown abdomens without conspicuous pattern and very narrow frons with slender ridge-like callus ..... 18  
Smaller species, or the abdomen patterned or callus not ridge-like ..... 20
18. Antennal plate with long dorsal spine reaching nearly to end of plate. Abdomen dark reddish, black-haired, with posterior margins of tergites and small middorsal triangles dark orange-haired. Beard and cheeks grey. Wing lightly infuscated, generally brownish along veins, fork of third vein with a short appendix or none .. **macquarti** (p. 114)  
Antennal plate with at most a strong dorsal tooth ..... 19
19. Face, cheeks and beard brown. Frontal callus brown. Antennae orange, unusually long and slender with the dorsal tooth close to base of plate. Wings evenly brown tinted, with long appendix on fork of third vein. Abdomen red, coppery-haired on tergites 1-4 and middle of 5, remainder dark and black-haired ..... **surifer** (p. 126)



- Face, cheeks and beard pale gray. Frontal callus black. Antennae dark brown to black, broader. Wings brown tinted, with a short appendix or none. Abdomen orange red on tergites 1 to 4, orange-haired, tergites 5-6 abruptly black and black-haired ..... **bigoti** (p. 110)
- 20(17). Subcallus bare and shiny, at least in part.....21  
 Subcallus pollinose unless denuded by wear .....24
21. Abdomen black or dark brown with a single prominent white middorsal stripe covering tergites 1-6. Frons over 6 times as high as basal width. Wings somewhat smoky along fore border and apex .....  
 .....**unistriatus** (p. 128)  
 Abdomen with dorsolateral stripes or spots.....22
22. Subcallus with a pair of crescent-shaped bare areas above antennal bases. Basal plate of third antennal segment broad, the plate subequal in length to style. Abdomen markedly pointed. Middorsal abdominal stripe a series of slender contiguous triangles, lateral stripes broad and continuous ..... **enanus** (p. 113)  
 Subcallus wholly bare except for a narrow strip of pollinosity separating it from frontal callus. Abdomen not pointed .....23
23. Notopleural lobes lighter in color than adjacent mesonotum. Abdomen black or dark brown, the middorsal stripe a prominent row of white contiguous triangles, more prominent than the white dorsolateral stripes which rarely extend beyond tergite 4. Third antennal segment orange to brown, the style always black .....**platycerus** (p. 119)  
 Notopleural lobes concolorous with mesonotum. Abdomen dull yellowish brown, the middorsal stripe a slender dull yellowish line, not more prominent than the dorsolateral stripes. Antennae usually wholly orange, the style seldom contrastingly black ..... **aniptus** (p. 110)
- 24(20) Abdomen dull yellowish with a single broad yellowish middorsal stripe covering tergites 1 to 6. Wings with veins strongly brown margined. Frontal callus drop-shaped. Eyes in life green, unbanded .....  
 ..... **rixator** (p. 125)  
 Abdomen otherwise .....25
25. Abdomen black with all tergites narrowly white on posterior margins, the margins widened into low triangles. Small black stout species with hyaline wings .....**quinquepunctatus** (p. 124)  
 Abdomen otherwise .....26
26. Slender brown species with long brown-tinted wings, unusually long black third antennal segment, and brown abdomen with a row of faint pale-haired mid-dorsal triangles ..... **lacajaensis** (p. 114)  
 Without the above combination of characters.....27
27. Abdomen with well-marked median and dorsolateral longitudinal stripes, sometimes composed of triangles or oblique patches, but at least the median stripe continuous .....28



Abdomen otherwise marked. (If abdomen with very faint stripes, see couplet 39) .....36

28. Vertex with a small, discrete raised tubercle. Frons less than 4 times as high as basal width, the callus as wide as high, yellow. Abdomen with a narrow even or irregular pale median stripe overlying a broad black integumental stripe. Dorsolateral stripes of broad, pale oblique contiguous patches. All femora pale, wings glass-clear, the fourth posterior cell broadly open .....**pungens** (p. 123)  
Vertex without tubercle, at most a small bare area .....29
29. Eyes unicolorous, bronzy to blackish green in life. Abdomen yellowish brown with 3 rather inconspicuous yellow-haired stripes, the mid-stripe of narrow contiguous triangles, the dorsolaterals of slightly oblique patches. Wings with all veins brown-margined, sometimes faint. Legs pale brown, the fore tibiae very obscurely bicolored .....  
.....**nondescriptus** (p. 116)  
Eyes banded in life. If wing veins brown-margined, then fore tibiae strongly bicolored .....30
30. Abdominal mid-stripe of a series of narrow connected triangles .....31  
Abdominal mid-stripe of even width throughout, rarely slightly irregular .  
.....32
31. All femora entirely black or dark brown, the tibiae paler brown, the fore pair very obscurely bicolored. Wings glass clear. Abdomen nearly black, the dorsolateral stripes even .....**dunni** (p. 112)  
Mid and hind femora largely pale, only somewhat infuscated basally, the fore pair blackish and fore tibiae sharply bicolored. Wings with small faint clouds on crossveins and fork of third vein. Abdomen reddish brown with a small black integumental triangle on middle of tergites 1 and 2. Dorsolateral stripes markedly step-like, of oblique patches .....**commixtus** (p. 111)
32. Frons broader, less than 4 times as high as basal width, the basal callus round or square, yellow to red. All femora pale; fore tibiae clearly bicolored. Wings glass clear. Abdominal stripes broad and even, yellowish. Scutellum red, contrasting with blackish mesonotum .....  
.....**vittiger guatemalanus** (p. 127)  
Without the above combination of characters.....33
33. Frons about 4 times as high as basal width, parallel sided, the callus usually dull yellowish. Mid and hind femora pale, fore femora black, fore tibiae conspicuously bicolored. Wings glass clear. Abdominal stripes broad, chalky white, the dorsolaterals slightly uneven. Scutellum black, concolorous with mesonotum ....**colombensis** (p. 110)  
Frons narrower, 4.5 to 6 times as high as basal width, markedly convergent below. Wings always slightly to moderately brownish tinted, especially costal cell and tips of first 2 veins .....34



34. Mid and hind femora entirely pale, rarely slightly dusky at extreme base. Scutellum reddish, at least at apex. Abdomen yellow to brown, without conspicuous black patch at base either dorsally or ventrally. Abdominal stripes generally broad and even, yellow to nearly white .  
.....**occidentalis** var. **dorsovittatus** (p. 117)  
Mid and hind femora at least 1/4 black at base. Scutellum black .....35
35. Abdomen yellow to brown, the stripes yellow pilose as are sternites. A conspicuous black integumental median patch on first 2 sternites and usually a black triangle on first 2 tergites .....**stenocephalus** (p. 125)  
Abdomen black to dark brown, the median stripe white, narrow, the dorsolateral pale stripes usually faint, reduced or absent. Sternites with dark integument but white pilose and pollinose .....  
.....**occidentalis** var. **modestus** (p. 117)
- 36(27) Abdomen with conspicuous dorsolateral rows of pale haired spots, and a smaller median row of pale triangles .....37  
Abdomen otherwise .....38
37. Large stout species, black or brown, mesonotum striped, abdomen with median row of small slender pale triangles and dorsolateral rows of small round discrete pale spots. Wings glass clear. Eye purple with 2 narrow green bands .....**pruinusus** (p. 122)  
Slender grey species with dorsolateral oblique pale-haired patches on abdomen, wings grayish. Eyes greenish bronze with single narrow dark stripe .....**praepilatus** (p. 120)
38. Hind femora basally at least 1/3 black, remaining femora and coxae all or largely black. Abdomen orange brown, with a black integumental inverted triangle on first 2 tergites, sometimes also median black streaks on one or more of succeeding tergites. Vestiture black except for a dorsolateral row of orange haired round or oval patches, sometimes contiguous and forming broad stripes. Median stripe, when evident, faint, slender, yellow-haired. Frons about 5 times as high as basal width .....**praeteritus** (p. 120)  
All femora entirely pale.....39
39. Abdomen with a black inverted integumental triangle on first 2 tergites, as in **praeteritus**, but pale median pilose stripe more evident and dorsolateral pale pilose patches more slender and paler .....  
.....**praeteritus adiaxolus** (p. 121)  
Abdomen without middorsal integumental black triangles and frons broader .....40
40. Abdomen dull yellowish brown, contrasting with steel gray thorax, with 3 very faint and inconspicuous pale-haired stripes. Wings hyaline. Frons broad, about 2.5 times as high as basal width, the callus black .....**rhizophorae** (p. 124)  
Abdomen dull yellowish brown, slightly paler than the dull brownish thorax, with 3 equally faint paler stripes. Wings with all veins narrowly brown-margined. Frons 3.5 to 4 times as high as basal width, the callus yellow .....**nereus** (p. 116)



**Tabanus albocirculus** Hine

**Tabanus albocirculus** Hine 1907, Ohio Nat., 8(4): 227, female, Tucurrique, Costa Rica. Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28 p. 88, synonymy. Goodwin and Murdoch, 1974 Ann. Ent. Soc. Amer., 67(1): 128, Figs. 16,37. Wilkerson, 1979, Cespidesia 8(31-32): 363-365.

**Tabanus (Bellardia) albocirculus:** Fairchild, 1942, Psyche, 49(1-2): 11-12, figs. 4, a, b, Panama. Fairchild, 1946, Ann. Ent. Soc. Amer., 39(4): 575-576, Almirante and Robalo, Bocas del Toro, Panama.

**Tabanus (Lophotabanus) albocirculus:** Fairchild, 1953, Proc. Ent. Soc. Washington, 55(5): 241.

This species is exceedingly variable in size and color but can be separated from related species in Panama by the eye pattern, which consists of 3 broad green transverse bands on a purple ground color. The typical form, which is nearly black in body color with almost wholly black femora, occurs chiefly in areas of heavy rainfall, such as Bocas del Toro province where it is the only form taken, Darien (Cerro Pirre) and the Atlantic coast generally, with a few records from the Pacific coast in the Canal Zone. The pale form is smaller, with light reddish ground color and femora almost wholly reddish yellow, and is dominant along the Pacific coast from Darien to Chiriqui provinces, though specimens have also been taken on the Atlantic coast in the Canal Zone area.

Intermediate forms, with darker ground color and femora basally blackened are dominant in San Blas and Darien provinces, but occur on both coasts in the Canal Zone, though not, apparently in Bocas province.

The few males collected have all been light or intermediate in color, and are easily associated with the female. The eyes have the area of large facets small and triangular, less than half eye area, and the facets not greatly enlarged. There is a tubercle at vertex between the eyes, reaching eye level. The palpi are oval, inflated, porrect, and the body more hairy than the female, with the abdominal mid-dorsal triangles smaller and less distinct. All males seen have been taken in mosquito light traps.

The species is one of the commonest taken in the lowlands and in open areas, though it occurs also in heavy forest, at ground level. It attacks horses, but not man and is taken abundantly in horse-baited mosquito stable traps, Malaise traps and Shannon traps. Both sexes have been taken in light traps, though females are taken during the day as well. The flight season appears to extend throughout the year, though there are more records for the rainy season from May to December. Males were taken in April (1) and September (4). The range is from Nicaragua to Colombia west of the Andes. Goodwin and Murdoch (1974) reared one of 3 larvae collected. It yielded a male of the light form, from Santiago, Panama.

**T. albocirculus** is very similar to **T. antarcticus** Linn. (=xipe Kroeber) but the latter has the male eye with strongly differentiated large facets, the wings usually with faint clouds around cross veins and fork of third vein, more intense than the general wing infuscation, and the frons of the females is slightly broader, on the average. **Antarcticus** has so far been seen only from S. America east of the Andes, and the two species may prove to be only subspecifically distinct. Eye patterns of both are the same.



**Tabanus aniptus** Fairchild.

**Tabanus aniptus** Fairchild, 1976, Stud. Ent. 19(1-4): 241-244, fig. 1 female. Colombia, Panama. Wilkerson, 1979, Cespedia 8(31-32): 365-367, male. Colombia.

**Tabanus trivittatus**, Lee Fairchild and Barreto, 1969, Caldasia 10(49): 455. Not Fabricius 1805.

Only a single specimen of this recently described species has been seen from Panama, taken at Jaque, Darien Prov., 7 April. 1967 by the noted herpetologist Charles W. Myers. It differs from its nearest Panama relative, **T. platycerus** Fchld. in having dark concolorous notopleural lobes and the stripes of the abdomen yellowish and rather inconspicuous. The species is apparently abundant in Colombia along the Pacific coast, extending to Ecuador.

**Tabanus bigoti** Bellardi

**Tabanus apicalis** Macquart, 1847, Dipt. Exot. Suppl. 2: 20. Mexico. Not Wiedemann 1828.

**Tabanus bigoti** Bellardi, 1859, Sagg. Ditt. Messico, 1: 58. New name for **T. apicalis** Macq. Fairchild, 1942, Ann. Ent. Soc. Amer., 35(4): 443, Pl. 1, fig. 4. in part, form B; 1971, Cat. S. Amer. Dipt. Fasc. 28 p. 89, synonymy.

This species can be separated from the similar and more abundant **T. surifer** Fchld. by black antennae with shorter dorsal tooth, black and more slender frontal callus, grey pollinosity of face, cheeks and thorax, and lack of a long appendix at fork of third vein. The eye is bright bluish green in life.

In Panama the species is uncommon. Most material was taken at our Yellow Fever station S. W. of Almirante, Bocas del Toro, in an area of heavy rain forest. Scattered specimens were taken at Mandinga, San Blas, Cerro Azul east of Panama City and near Gamboa, C. Z., in Shannon traps, in a tent, or flying about the collector. The season of flight is short, as of 32 specimens available with data, 28 were taken in May, 1 in April, 2 in June and 1 in July. Specimens from Wauchope, Limon, Costa Rica were taken on 3 June and a series of 6 from Lagos Montebello, Chiapas, Mexico, R. L. Dressler coll. were taken in May. The species ranges from Mexico to eastern Colombia.

**Tabanus colombensis** Macquart

**Tabanus colombensis** Macquart 1846, Dipt. exot., Suppl. 1, p. 37, Pl. f, fig. 2. Fairchild, 1956, Smiths, Miscell. Col., 131(3): 13; 1971, Cat. S. Amer., Dipt. Fasc. 28, p. 90. Synonymy. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 120, fig. 38. Fairchild, 1983, Ent. Soc. Amer. Misc. Publ. No. 57, p. 19.

**Tabanus truquii** Bellardi, 1859, Sagg. Ditt. Messicana 1: 64, male, Mexico. (New synonymy).

**Tabanus amplifrons** Kroeber, 1933, Rev. Ent., 3(3): 354. Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 178-179, Pl. 2, fig. 17. Philip, 1942, Psyche. 49(1-2): 23.



This species can be separated from others of the group with 3 striped abdomens by the combination of broad, even, chalky white stripes, wholly pale femora in the female, glass clear wings and parallel sided frons. The male has the upper facets but slightly differentiated and densely hairy, while the femora are largely black. The eyes of the female are purple with two broad green bands, the area above the upper band greenish purple. In Panama it is not a common species. A year's collecting at Mojo Pollo on the Chagres river yielded 39 specimens, and 1 male 3 females were taken at Sta. Fe, Darien in April and May 1967. I recorded a few others from the Canal Zone in 1942, and have since seen a male and a female taken in a light trap at Sta. Clara, Cocle prov. and a female taken near Gatun, C. Z. in a horse baited mosquito trap. It apparently does not attack man, and may be more abundant in drier areas of Panama where little collecting with bait animals has been done. Our records include the months from February to September, so it probably flies throughout the year. The range is extensive, from Texas to northern Brasil. Goodwin and Murdoch (1974) collected over 65 immature specimens from which 50 adults emerged, mostly from moist soil near water on the Pacific side of the isthmus. The larvae seem indistinguishable from other species of the *lineola* group, but the pupa is figured.

#### ***Tabanus commixtus* Walker**

***Tabanus commixtus*** Walker 1860, Trans. Ent. Soc. London, 5: 273. Mexico. Fairchild, 1956, Smithsonian Miscell. Colls. 131(3); 1983, Ent. Soc. Amer. Misc. Pub. No. 57, p. 19, figs.

***Tabanus maya*** Bequaert, 1932 (1931), J. N. Y. Ent. Soc., 39: 546, fig. 2, female, Yucatan, Mexico. Fairchild, 1942, Ann. Soc. Amer., 35(2): 176, Pl. 2, fig. 19, male, female, Panama.

***Tabanus truquii***: Philip, 1965, Ann. Ent. Soc. Amer., 58(6): 876. Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 103. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 126, fig. 42, pupa. Not *truquii* Bell.

This species is most readily separated from the other local species with 3 abdominal stripes by having the mid-stripe a series of narrow connected triangles and the lateral stripes of somewhat oblique dashes. The wings have a faint though unusually distinct cloud on fork of third vein, the frons is parallel sided, and there is usually a dark integumental patch beneath scutellum extending onto the second abdominal tergite. The male has the abdominal pattern faint and the large eye facets bare and slightly enlarged, in a triangular patch surrounded by small facets. Both sexes have the mid and hind femora basally black.

The species is widespread at low elevations, but not abundant. All records are from horse-baited stable traps, Malaise traps, taken biting animals or in light traps. It appears to fly throughout the year, but with a definite peak of abundance from April to June. Most records are from the Canal Zone area, due to concentration of horse-baited traps, where it is almost equally abundant on both coasts. Other records are from the Pacific coast with a single record from Sasardi, San Blas on the Caribbean coast. It was not taken during several years intensive collecting in Bocas del Toro prov., and appears to favor open country. The range is from Mexico to Trinidad.



Goodwin and Murdoch (1974) reared 3 specimens from the Pacific side of the Isthmus. These were the only specimens seen and only the pupa was described. They were taken in habitats similar to those where *colombensis* larvae occurred.

### ***Tabanus defilippii* Bellardi**

***Tabanus defilippii* Bellardi 1859, Sagg. Ditt. Messicana, 1: 57-58. Female, Mexico.**

***Tabanus (Bellardia) defilippii*: Fairchild, 1942, Psyche, 49(1-2): 10-11, figs. 2, a, b. Panama, full references; 1971, Cat. S. Amer. Dipt. Fasc. 28 b. 91, synonymy.**

This large blackish brown species with prominent pale-circled black spot on scutellum is likely to be confused only with *T. polyphemus* Fchld. The latter is paler in color, with red-brown abdomen usually bearing small yellow-haired triangles, orange legs and antennae and golden-haired palpi.

*Defilippii* is known in Panama mainly from heavy forest in Bocas del Toro province, where it is highly arboreal, over 90% of specimens taken at our Yellow Fever station near Almirante were taken in the forest canopy attracted to humans. The few other specimens were taken in a Shannon trap or biting a horse. We have also 1 female from Sta. Fe, Veraguas also taken in the forest canopy, and there is another female in M. C. Z. from Buena Vista, Chiriqui, both areas of high rainfall and heavy forest. The eyes in life are unicolorous bronzy green.

Our records show the species flying from March to September in Panama, with most records in April, May and June. The range is from western Panama to southern Mexico.

### ***Tabanus dunni* Fairchild**

***Tabanus dunni* Fairchild 1942, Ann. Ent. Soc. Amer., 35(2): 166-167, Pl. 2, fig. 18; 1983, Ent. Soc. Amer. Misc. Publ. No. 57, p. 21, figs.**

This rare species resembles *T. commixtus* Walk. in the markings of the abdomen, but is black in ground color and with a broader frons. The femora are dark grey to black, the wings glass clear. The eyes in life bear 2 rather narrow green stripes on a purple ground. The mesonotum in fresh specimens is also quite markedly striped, unlike other members of the group in Panama. The species was described from 5 females from Miraflores and Ancon in the Canal Zone, taken in Jan. 1930 by L. H. Dunn. Since then only 3 females have been secured, 1, Old Panama, bred from larva 11 Aug. 1942, the larva collected in tidal mangrove swamp but pupal shell lost; 1, vic. Nata, Cocle prov., 20 May 1946, and 1, Sta. Fe, Darien prov., O. I. C. S. 1591, 26 May 1967. The species seems confined to the Pacific coast of Panama and may have specialized habits. In 1942 (Ann. Ent. Soc. Amer. 35(4): 472) I recorded a specimen from Nicaragua, but this later proved to be *T. pruinus* Big., as I noted in 1951 (Ann. Ent. Soc. Amer., 44(3): 460)] The two are somewhat similar, but *pruinus* lacks the abdominal stripes. The Nicaraguan specimen was badly denuded.



**Tabanus enanus** Fairchild

**Tabanus enanus** Fairchild 1942, Ann. Ent. Soc. Amer., 35(2): 157-158, Pl. 1, fig. 8; 1976, Stud. Ent. 19(1-4): 239, 348, fig. 5. Panama.

The holotype of this species was an unusually small specimen, as later collections have shown the size to be from 10-12 mm. The subcallus generally shows a narrow transverse bare area just above the antennal bases, the abdomen has a narrow median stripe of narrow connected triangles and broader lateral stripes of straight disconnected pale dashes, while the hind margins of the tergites are narrowly pale margined. The markedly narrowed and pointed abdomen is very characteristic. The eyes (revived) have 3 green bands, the upper 2 connected or nearly so at their outer ends, similar to **unistriatus** and **trivittatus**. The male is unknown.

We have taken a few specimens in horse baited mosquito traps on the Pacific side of the Canal Zone in Feb. and March 1953, and a single specimen at Anton, Cocle Prov. in Jan. 1964. The Interoceanic Canal Survey took a long series of over 100 specimens in a Malaise trap at Sta. Fe, Darien Prov. from Jan. to April 1967, so that the species appears to fly only at the height of the dry season. All the localities are close to the coast on the Pacific side of Panama. The species is not known elsewhere.

**Tabanus erebus** Osten Sacken

**Tabanus erebus** Osten Sacken 1886, Biol. Centr. Amer., Dipt., 1, p. 50. Female, Nicaragua, Panama. Fairchild, 1942, (1943). Ann. Ent. Soc. Amer., 35(4): 443, fig. 1. full references. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 128, Fig. 20.

One of the largest **Tabanidae** in Panama, this species is easily recognized by its entirely black color, including the wings. Only the halteres are ivory white. the abdomen is bluish pruinose, as in the N. American **T. atratus**, which it greatly resembles. The rare **T. morbosus ebeneus** is the same color, though with paler wings, but has a narrower frons and slender antennae without a strong dorsal spine. The eyes are black in life, without pattern and the male is still unknown.

In Panama the species is widespread but limited to forested areas of heavy rainfall, ascending in the mountains to 5,000 ft. It bites man occasionally, but prefers larger animals. Hunters say that its abundance indicates the presence of tapir in the vicinity. Most of the material was taken in Shannon traps. The flight season appears to be rather short, as with the exception of 1 specimen taken in December, all of nearly 200 specimens were taken from April to September, over half in May. The range is from Honduras to Panama.

Goodwin and Murdoch (1974) figure a very large larva taken at Ft. Kobbe, Canal Zone, which they failed to rear, but felt was probably **T. erebus**, as this is the only Panamanian species of sufficient size likely to be found in this area.

**Tabanus importunus** Wiedemann

**Tabanus importunus** Wiedemann 1828, Auss. Zweifl. Inskt., 1, p. 127, female, Brasil. Fairchild, 1943, Ann. Ent. Soc. Amer., 35(4): 444-445,



fig. 2, references; 1971, Cat. Dipt. S Amer. Fasc. 28, p. 95, synonymy. 1984, Contr. Amer. Ent. Inst., 21(3): 25, Map 1. Wilkerson, 1979, Céspedesia 8(31-32): 376-377 Coscaron, 1979, Obr. Cent. Mus. La Plata, 6: 264, fig. 4.

This large brown species is likely to be confused only with *T. nebulosus*, from which it is easily separated by the unusually short stout palpi and absence of pale-haired middorsal abdominal triangles. The eyes in life are unbanded, pale glaucous green. Males of *importunus* and *nebulosus* are difficult to separate, though the latter usually have middorsal pale triangles and a more extensive and distinct patch of black pilosity on the mid posterior border of mesonotum.

All specimens seen from Panama have come from the Canal Zone area, and all but a very few from horse-baited mosquito stable traps or biting cattle and horses. Specimens have been taken in every month save Feb., June and Dec., though there seem to be peaks of abundance in May and August. It is probably more widespread and abundant than records show, but since it does not apparently occur in forested areas and is attracted only to large animals, our collecting methods outside the Canal Zone did not reveal its presence. The range is extensive, from Panama to Paraguay; it apparently does not extend into Costa Rica or farther north.

#### *Tabanus lacajaensis* Kroeber

*Tabanus lacajaensis* Kroeber 1931, Stett. Ent. Zeit., 92(1-2): 303, Costa Rica. Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28 p. 95, synonymy.

*Tabanus umbraticolus* Fairchild, 1943, Ann. Ent. Soc. Amer., 35(4): 450-451, Fig. 7 (1942), female, Panama.

This is a slender brown fly with unusually long brown-tinted wings, narrow frons, and long, slender black third antennal segment. It closely resembles *T. unipunctatus* Big., but lacks a black scutellar spot. The eye is unbanded, dull bronzy in life. Records are all from the mountains of Chiriqui and Bocas del Toro provinces, those from Cerro Pando, Bocas prov. being larger and darker than those from Boquete. The only available male is like the female from Cerro Pando, in being very dark, the eyes bare, holoptic, the upper eye facets not differentiated or enlarged, and with a small bristly tubercle sunk between the eyes at vertex. The species has been taken from March to May at Boquete, with a single record for October. It was described from near San Jose, Costa Rica, and I have seen material from the same area. It has not been reported from elsewhere. If the single male mentioned above is properly associated, then a further difference from *unipunctatus* occurs, since in the latter, the upper eye facets are enlarged and well demarcated and differentiated from the small facets.

#### *Tabanus macquarti* Schiner

*Tabanus macquarti* Schiner 1868, Reise Novara, Dipt., p. 89, female, Colombia. Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 96, synonymy. Wilkerson, 1979, Céspedesia 8(31-32): 377-379.



**Tabanus (Chelotabanus) macquarti:** Fairchild, 1964, J. Med. Ent., 1(2): 181-183, fig 6, references. Panama, Colombia.

This species is similar in appearance to **T. bigoti** and **T. surifer**, but the dorsal antennal tooth is very long and spine-like, reaching to or beyond end of basal plate. The antennae and legs are largely black, the wing brownish, especially along fore border, and there is frequently a short appendix on fork of third vein on one or both wings.

In Panama the species has only been taken in wet montane forest in Darien province, on Cerro Pirre and Cerro Quia, and on the upper Rio Mono, all localities close to the Colombian border. Some were taken attacking man at ground level, others in Shannon or Anderson traps, from Jan. to March, 1961 and 1969. Flight season is not necessarily limited to these months, as little collecting has been done in this area and only at that time of year. The range is from Costa Rica to Ecuador and Venezuela, apparently mainly in lower montane rain forest.

#### **Tabanus morbosus ebeneus** Philip

**Tabanus ebeneus** Philip, 1966, Ann. Ent. Soc. Amer., 59(3): 525-526, fig. 4. Female, Guatemala, Panama.

**Tabanus morbosus** Stone, 1938, U. S. Dept. Agric. Miscell. Pub. No. 305, pp. 89-90, fig. 36. Female, Arizona.

**Tabanus morbosus ebeneus:** Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 96. Burger 1976, Southwestern Naturalist, 21(1): 117-121.

Only a single specimen, a paratype from Chiriquicito, Bocas del Toro prov., May 1917, is known from Panama. The holotype and another paratype were taken in Guatemala. The species differs from **erebus** O. S., the only similar local species, in more slender callus and narrower frons, paler wings, and more slender antennae without a strong dorsal spine. Nothing is known of the habits of ssp. **ebeneus**; Burger (loc. cit.) collected and reared larvae of **morbosus** from several localities in Arizona, but found the adults very rare.

#### **Tabanus nebulosus** De Geer

**Tabanus nebulosus** De Geer 1776, Mem. Serv. Hist. Ins., 6: 227, Pl. 30, fig. 2, female, Surinam. Fairchild, 1971, Cat. S. Amer. Dipt., fasc 28, p. 96, synonymy; 1984, Contr. Amer. Ent. Inst. 21(3): 27, Map 3. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 130, Fig. 39.

**Tabanus ferrifer** Walker, 1850, Ins. Saunders., 1, Dipt., p. 30, Barbados. Fairchild, 1943 (1942), Ann. Ent. Soc. Amer., 35(4): 444, fig. 3, female, Panama.

The earlier references are listed by Fairchild (1943) under **ferrifer**; the extensive synonymy in the Cat. S. Amer. Dipt. This is a large brown horse fly with parallel-sided frons, ridge-like callus and a median row of small yellow-haired triangles and sublateral rounded spots on abdomen. The eyes in life are yellowish green with reddish purple highlights, without pattern. The male is similar in color and the eyes, though not much enlarged, have the area of enlarged facets well differentiated and demarcated from the small. **T. importunus**



is the most similar species, but differs in very short inflated palpi, in lacking the mid-dorsal pale-haired triangles on abdomen, and in usually having at least a small area of infuscation on the wing beneath the stigma. Both species have a patch of black hairs before the scutellum.

In Panama *nebulosus* is common and widespread in the more open habitats at lower elevations. It bites primarily horses and cattle, not man, and may be a serious pest at times. Most of the available records are from horse-baited mosquito traps in the Canal Zone area, as little collecting from bait animals has been done elsewhere. Males are frequently taken in light traps. The species flies throughout the year, though it appears to be most abundant from March to May and from August to October. The species ranges from British Honduras to southern Brasil.

Goodwin and Murdoch (1974) describe and figure the female pupa, one of 2 they reared from a total of 3 specimens collected, apparently as pupae, as the larva is not mentioned.

### ***Tabanus nereus* Fairchild**

***Tabanus nereus*** Fairchild 1943, Ann. Ent. Soc. Amer., (1942) 35(4): 446, fig. 9, female, Panama; 1958, Ann. Ent. Soc. Amer., 51(6): 530; 1973, Proc. Ent. Soc. Washington, 73(3): 322-323, fig. 3. Wilkerson, 1979, Cespedesia 8(31-32): 379-380. Colombia. Fairchild, 1983, Ent. Soc. Amer. Misc. Publ. No. 57, p. 24, fig.

This small inconspicuous yellowish-brown species has the eyes in life green with a narrow midstripe and the lower margin broadly purple. The abdominal markings consist of 3 faint stripes. It much resembles small specimens of *non-descriptus*, but in addition to the patterned eyes has a broader frons, nearly round yellow callus, and more slender palpi. Head characters and eye pattern suggest relationship with *T. guatemalanus*.

In addition to the specimens previously listed, from the Canal Zone, Darien and Herrera provinces, it has been taken in horse baited stable traps at Ft. Kobbe, C. Z., and a long series was taken at Curiche, Dept. Choco, Colombia, in a Malaise trap by personnel of the O.I.C.S. survey. There is also a single specimen from Guayaquil, Ecuador, May-June 1913, C. T. Brues coll. in M.C.Z. Collections show this to be also a coastal species and flying throughout the rainy season from May to Dec.

### ***Tabanus nondescriptus* Fairchild**

***Tabanus nondescriptus*** Fairchild 1973, Proc. Ent. Soc. Washington, 75(3): 323-326, fig 4.

***Tabanus rixator*:** Fairchild, 1958, Ann. Ent. Soc. Amer., 51(6): 530, in part, not Fairchild 1943.

A small dull brownish species with 3 inconspicuous pale stripes on abdomen, wings with all veins narrowly brown margined, frontal callus brown, higher than wide, and eyes unpatterned.

The species is exceedingly close to *nereus* Fchld., but differs in having unbanded eyes, a higher, more rectangular callus, differently shaped antennae, more prominently striped abdomen and larger average size. The means and me-



dians for wing lengths of available specimens of *nereus* are both 9.5 mm., and for *nondescriptus* 11.13 and 11.25 mm., for those from Sta. Fe, Darien, and 11.0 and 10.5 for those from all other localities. It differs from *rixator* in generally larger size, reddish scutellum, long oval or oblong callus, and in lacking a broad prominent yellow stripe on abdomen.

The species occurs near or in mangrove swamps along the Pacific coast from Darien prov. to the Canal Zone area. Specimens have been taken flying about the collector, in horse-baited mosquito stable traps and most abundantly, in Malaise traps. It appears to fly throughout the year, with perhaps a peak of abundance from Feb. through May. It has not yet been collected outside of Panama.

***Tabanus occidentalis* var. *dorsovittatus* Macquart**

***Tabanus dorsovittatus* Macquart, 1855, Dipt. Exot., Suppl. 5. p. 50.**

***Tabanus dorsiger* var. *dorsovittatus*:** Fairchild, 1971, Cat. S. Amer., Dipt. Fasc. 28, p. 92, synonymy. Goodwin and Murdoch, 1974 Ann. Ent. Soc. Amer., 67(1): 124 fig. 17.

***Tabanus lineola* var. *carneus*:** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 173-174, Pl. 2, figs 21-25. Synonymy.

***Tabanus occidentalis* var *dorsovittatus*:** Fairchild, 1983, Ent. Soc. Amer. Misc. Publ. No. 57, p. 26.

This is the most abundant horse-fly in Panama, and the one most likely to be taken by the casual collector, as it is found primarily in open country and cleared land, and is a serious pest of cattle and horses. It varies considerably both in size and coloring. Females with wing lengths of 7 mm. to 11 mm. have been seen, while the abdominal stripes may be chalky white to distinctly yellowish. The mid and hind femora are always entirely pale. Males have been taken hovering in open areas, and are abundant in light trap catches, like its close relative *lineola* in N. America. The extent and size of the upper eye facets is also variable, but they are always clearly demarcated from the small facets. The species occurs throughout Panama up to elevations of at least 3000 ft., but is apparently absent from heavy primary forest. The various forms of *occidentalis* range from North Argentina to Mexico.

This and the 2 following forms are treated here as in my recent revision of the *lineola* group (Fairchild 1983), though this may not be the final word. Neither a statistical study nor examination of the female genitalia has been done.

Goodwin and Murdoch (1974) found this one of the commonest species they collected as larvae, and they reared over 100 to the adult stage. They figured the larva and stated that the pupa was not separable from that of *T. colombensis* Macq. Larvae were widespread in damp soil near water, mostly on the Pacific side of the isthmus. The other forms of the species were unfortunately not secured.

***Tabanus occidentalis* var. *modestus* Wiedemann**

***Tabanus modestus* Wiedemann, 1828, Auss. Zweifl. Ins., 1: 146.**

***Tabanus lineola* var. *plangens* Walker:** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 174.



**Tabanus dorsiger** ssp. **modestus**: Fairchild, 1971, Cat. Dipt. S. Amer. 28: 92.

**Tabanus occidentalis** var. **modestus**: Fairchild, 1983, Ent. Soc. Amer. Misc. Pub. No. 57, p. 26.

This form resembles **stenocephalus** in structure and eye color, but is much darker, the abdomen nearly entirely black with a narrower white middorsal stripe and the mid and hind femora over two-thirds black basally. The only males I have seen resemble those of **stenocephalus** with the abdomen dark reddish brown and the stripes yellow; they differ however in having the upper eye facets well demarcated and differentiated, being in this respect like **occidentalis** var. **dorsovittatus**. The 2 males studied were collected in Antioquia, Colombia together with females, and both sexes of **dorsovittatus**.

The form appears to range from Honduras to southern Brazil and eastern Peru. Brazilian examples show every intergrade with **dorsovittatus**, while Panama specimens can nearly always be separated by the black scutellum and largely black hind femora.

In Panama, **modestus** has been taken on both sides of the isthmus in the Canal Zone area, but shows a marked preference for primary forest in areas of high rainfall, being common at our Yellow Fever station near Almirante, and at our Rio Tacarcuna camp in Darien, where neither **dorsovittatus** nor **stenocephalus** were taken. Most of the available specimens were taken in Shannon traps.

#### **Tabanus oculus** Walker

**Tabanus oculus** Walker 1848, List Dipt. Brit. Mus., 1: 157. Female, Honduras. Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28 p. 98, synonymy.

**Tabanus (Bellardia) oculus**: Fairchild, 1942, Psyche 49(1-2): 12-13. figs. 3 a, b. Female, Panama, full references.

This species can be separated from the very similar **T. pseudoculus** Fchld. by having the first posterior cell of the wing always closed and petiolate and having distinct though pale brown clouds around cross veins at ends of discal cell and at fork of third vein. The frons is also slightly narrower and the eye pattern with 2 or 3 fairly wide green bands and the lower margin green.

Only a single specimen has been taken in Panama, and that was collected many years ago by L. H. Dunn in extreme western Chiriqui province, close to the Costa Rican border. This specimen was taken together with **T. albocirculus** and **T. pseudoculus** attacking a mule at Camp Pital, and all were reported by Dunn (1934a) as **T. albocirculus**. The species ranges north to southern Mexico.

#### **Tabanus olivaceiventris** Macquart

**Tabanus olivaceiventris** Macquart 1847, Dipt. Exot. Suppl. 2: 18. Male (Female), Para, Brasil. Fairchild, 1964, J. Med. Ent. 1(2): 184-185. Male, female, Panama, references; 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 98, synonymy; 1984, Contr. Amer. Ent. Inst. 21(3): 30, fig. 17, Map 8. Wilkerson, 1979, Cespedesia, 8(21-22): 380-382.



In life this species has an unmarked yellowish green abdomen which fades to dirty yellow in older preserved specimens. The thorax is steel grey with a small contrasting spot of black hairs just in front of scutellum. The wings are generally glass clear, occasionally brownish tinted along the veins. The frons is parallel sided, narrow, with a slender ridge-like callus. The eyes in life are pale glaucous green, unbanded. The male is similar in color, but with abdomen densely white-haired, upper eye facets only moderately enlarged but well demarcated from small facets, and with a very small tubercle sunk between eyes at vertex. This species appears to belong to a group including *T. importunus*, *T. nebulosus* and *T. punctipleura*, all of which have a black spot on hind border of mesonotum and unicolorous glaucous green eyes. The species are superficially quite different in color, but frons and frontal callus are quite similar in all.

Only a single specimen has been taken in Panama, at Cerro Pirre, Darien Prov., 5 Feb. 1961. The locality is at 1500 ft. in wet montane forest. The specimen was taken in a Shannon trap. The species ranges southwards across northern South America at least to the mouth of the Amazon.

### ***Tabanus platycerus* Fairchild**

***Tabanus platycerus* Fairchild 1976, Stud.Ent., 19(1-4): 242, 251-253, fig.**

9. Female, Panama, Costa Rica.

***Tabanus (Neotabanus) fumatipennis*: Fairchild, 1942, Ann. Ent. Soc.**

Amer., 35(2): 162, Pl. 1, fig. 3. Not Kroeber 1933, misident.

Although not abundant, this small species appears to occur throughout Panama at low elevations. Most specimens were taken in horse-baited mosquito stable traps, in Malaise traps, or from the screens of a railroad track car running through banana plantations. The male has not yet been taken. Specimens look like small *T. occidentalis* var. *modestus*, but the frons is much narrower and the subcallus bare and shiny. In the Canal Zone area and Darien records are all from April to June, though in Almirante it was taken into October. It appears to range north to Nicaragua, but has not so far been taken south of Panama.

### ***Tabanus polyphemus* Fairchild**

***Tabanus (Lophotabanus) polyphemus* Fairchild, 1958, Ann. Ent. Soc.**

Amer., 51(6): 527-528. Female, Panama.

***Tabanus (Lophotabanus) fumomarginatus* (Hine): Fairchild, 1951, Ann.**

Ent. Soc. Amer., 44(3): 455-456, figs. 7, 7a, 7b. Female, Panama.

Not Hine 1920, misident.

This species is quite similar in general appearance to *T. defilippii*, but is paler, with reddish orange legs, a middorsal row of pale haired triangles on abdomen, and a broader frons with better developed basal callus. The third antennal segment is orange, with but a moderate dorsal angle. The eyes in fresh specimens are bicolored, the lower 2/3 green, the upper third bronzy, the line between the two colors sharp.

In Panama the species has only been taken in areas of heavy forest in the eastern half of the country, from Cerro Azul and several localities in Darien Province. All specimens were taken April or May, in Shannon or Malaise traps,



and it does not appear to be common. Elsewhere it is known from Honduras, Guatemala and the Mexican states of Tabasco and Vera Cruz, and Colombia. A series of 10 specimens were taken attracted to man in the forest canopy at Lancetilla, Honduras, so the species may be predominantly arboreal. This combined with an apparently short flight season, may account for the few specimens taken in Panama, where arboreal catches may not have been made in localities where it occurs at the right time of year.

**Polyphemus** is very similar to **T. fumomarginatus** Hine, differing in slightly better defined frontal callus, broader third antennal segment, and smaller, orange-haired median triangles on abdomen. It is quite possible that the two may be only subspecifically distinct. Wilkerson (1979) did not find the species in western Colombia.

### **Tabanus praepilatus** Fairchild

**Tabanus praepilatus** Fairchild 1943, Ann. Ent. Soc. Amer., (1942) 35(4): 445-446, fig. 11, Panama; 1953, Ann. Ent. Soc. Amer., 51(6): 530, male; 1973, Proc. Ent.Soc. Washington, 75(3): 320, fig. 2. Goodwin and Murdoch, 1974, Ann. Ent. Soc. Amer., 67(1): 130, figs. 18, 40.

A slender grayish brown species with clear wings and 3 rows of pale spots on the abdomen. It somewhat resembles **T. pungens** Wied. but is usually larger, lacks the broad black middorsal abdominal stripe, and has quite different antennae, with style markedly longer than basal plate. The eyes are dull greenish with, usually, a slender median dark stripe which fails to reach lateral eye margin. All specimens seen have come from the vicinity of the Pacific coast, from Darien to Los Santos provinces, generally in or near mangrove swamps. The male and 1 female were taken in a light trap. The male resembles the female in color and pattern, the bare eyes holoptic, with upper enlarged facets well-differentiated and demarcated from small facets, covering about 3/4 of eye area. There is a small tubercle sunk between the eyes at vertex. Specimens have been taken in Jan., Feb., May and August, so that it probably flies throughout the year. The species has not been reported from elsewhere.

Goodwin and Murdoch (1942) took 3 larvae from white sandy soil at Guarare, Los Santos prov., Panama. A male was reared, and they were able to describe and figure both larva and pupa.

### **Tabanus praeteritus** Fairchild

**Tabanus praeteritus** Fairchild 1947, Ann. Ent. soc. Amer., (1946) 39(4): 579, 572, fig. 6, male, female, Panama; 1958, Op. cit., 51(6): 529-530. (in part). Wilkerson, 1979, Cespedia 8(31-32): 382-383.

A blackish-brown species with small round yellowish-brown callus extended above in a slender line. Wings grayish hyaline, no appendix on fork of third vein, thorax unstriped, blackish, as is scutellum; abdomen dull yellowish-brown with a black integumental triangle on first and second tergites, sometimes extended to form a continuous or broken black streak on succeeding tergites. Dorsolateral pale hair patches usually present on tergites 1 to 5, and often also a faint pale middorsal line, though both markings easily lost in denuded specimens. Fore tibiae obscurely bicolored, mid and hind tibiae dull yellowish-brown.



Fore femora blackish, mid and hind femora all dull yellowish or basally more or less blackish. The eyes are yellowish or greenish bronzy, unbanded.

The male has the upper eye facets but slightly enlarged and poorly demarcated from the small facets. It is otherwise similar to the female and easily associated with it. Only a single male, from Parrita, Puntarenas Prov., Costa Rica, has been seen. It is in the Los Angeles County Museum.

There appear to be two forms of this species, separable on small color characters and separated geographically. The typical form is slightly darker, has at least bases of mid and hind femora infuscated and the oval yellowish-haired dorsolateral spots on abdomen quite prominent. This form seems to be limited to the Pacific coast, where it occurs from Puntarenas prov., Costa Rica to Rio Raposo, south of Buenaventura, Colombia. In Panama, in addition to the type from Chepo. Panama prov., and paratypes from Ancon C. Z. and El Real Darien, I have a short series from Sta. Fe, Darien, taken in a Malaise trap in Jan., Feb., April and May 1967, by personnel of the O.I.C.S. The other form, with wholly reddish-yellow mid and hind femora and less prominent dorsolateral hair patches is described below.

***Tabanus praeteritus adiaastolus* Fairchild n. ssp.**

***Tabanus praeteritus* Fairchild 1958 Ann. Ent. Soc. Amer. 51(6): 529-530.**  
Not Fairchild 1947.

A dull blackish brown insect differing from the nominate subspecies largely in color, as follows: fore femora and coxae reddish brown, at most slightly darker than tibiae (in *praeteritus* both are black, contrasting with bicolored tibiae); mid and hind femora wholly yellowish brown (in *praeteritus* basally about 1/2 blackish); abdominal vestiture largely black, but with a tuft of pale yellowish hairs in middle of first tergite at apex of scutellum and in well preserved specimens a narrow middorsal pale pilose stripe (in *praeteritus*, there is no such tuft nor middorsal pale stripe, the tergites bearing fairly prominent orange pilose dorsolateral patches on at least tergites 2 to 4, often also on 1 and 5, though reduced in size. The callus in the present subspecies is usually yellow or brown, tapering upward gradually into the median callus, while in the nominate form the callus is more often black, abruptly joined to a slender thread-like median callus

Holotype female, Panama Canal Zone, Ft. Gulick, 28-V-1953, horse baited stable trap. To be deposited in Florida State Collection of Arthropods.

Paratypes, all females: 1, same locality as holotype, 28 Jan 1954, light trap; Canal Zone: 24, Fance Field, Jan to May 1953, horse traps, all somewhat rubbed; 13, Navy tank farm, Gatun, Galeta Point road, horse traps, Jan to June, 1953; 2, Coco Solito, horse trap, 1-VII-53; 1, Ft. Sherman, horse trap 13 Nov. 1951; 1, Ft. Davis, horse trap 19 Jan 1953; 1, Ft. Randolph, horse trap 11-VI-63; Bocas del Toro prov., 2, Almirante, biting horse, 14-VIII-63; Colon prov., 1, Porto Bello, Shannon trap, Oct. 63, 1, Mandinga, ?Shannon trap, 30-V-64; San Blas prov., 1, Rio Mandinga, 10-V-57, 1, Rio Tangandi Yellow Fever Camp, Shannon trap at dusk, 23-V-57, 1, Cuadi River 14-IV-67, 1 Sasardi, 14-IX-67, O.I.C.S. 3914. Specimens range from 10 to 14 mm in length. The name is from Greek, *adiaastolos*, meaning not separated, confused, as its distinction from *praeteritus* was only recently recognized.

The two taxa are both coastal, *praeteritus* known from localities on or near the Pacific coasts of Colombia, Panama and Costa Rica, while ssp. *adiaastolus*



seems confined to the Caribbean coast of Panama from San Blas province, to Almirante in Bocas del Toro prov. The bulk of our material was taken in horse baited mosquito stable traps on army reservations on the Atlantic side of the Isthmus in the former Canal Zone. A few were also taken in Shannon traps and light traps or biting a tethered horse. The eyes in life are unbanded, dull greenish or yellowish bronze. The 3 specimens from Atlantic coast localities listed in the original description of *praeteritus* are not now before me, but were no doubt the present subspecies.

### ***Tabanus pruinus* Bigot**

***Tabanus pruinus*** Bigot 1892, Mem.Soc. Zool. France 5: 683, male, Mexico. Philip, 1950, Ann. Ent. Soc.Amer., 43(1): 116, fig 2C. Fairchild, 1951, Ann. Ent.Soc.Amer., 44(3): 459-460, female, Panama; 1971, Cat. Dept. S.Amer., Fasc. 28, p. 99. synonymy. Burger 1974, Proc. Ent. Soc. Washington 76: 2): 106.

***Hybostraba albobillosa*** Kroeber, 1931, Stett. Ent.Zeit., 92: 92-93, male, Costa Rica. Fairchild, 1975, Proc. Ent. Soc. Washington, 77(2): 261.

Only 2 specimens have been seen from Panama, the female specimen mentioned by me in 1951 and a single male from Cerro Punta, Chiriqui, 5500 ft., at light, L. J. Bottimer coll., in C.N.C. Both localities are in the mountains of Chiriqui prov., not far from the Costa Rican border. This represents the farthest south record of the species, which ranges northward to southern Arizona. It is a blackish brown species with striped mesonotum, wholly clear wings, and abdomen with small median gray triangles and a row of sublateral small round gray spots on each side of the abdomen. The eyes are dark purple with 2 narrow green bands. The male is strikingly different, the abdomen nearly white due to long dense white hairs, and with the eyes densely short pilose on the area of enlarged facets. The male type of *H. albobillosus* Kroeber was studied on loan from Warsaw (Fairchild 1975) and agrees closely with this Chiriqui male. Specimens from Mexico and Arizona differ slightly from the Panama specimens in having more slender antennae, more prominent middorsal pale triangles on abdomen, and with male eyes essentially bare. If these differences hold up when adequate series become available, Kroeber's name is available for the Panama population.

### ***Tabanus pseudoculus* Fairchild**

***Tabanus (Bellardia) pseudoculus*** Fairchild, 1942, Psyche, 49(1-2): 13-14, figs. 1 a, b. Female, Panama. Wilkerson, 1979, Cespedia 8(31-32): 383-384.

***Tabanus albocirculus*** (Hine): Dunn, 1934, Psyche 4(3): 173-174, in part, not Hine, misident.

Although very similar to *T. oculus*, with which it has probably been confused, it differs from that species in always having the first posterior cell of the wing (4th R) open, though coarctate. The eyes in life are purplish bronze with two very narrow bands and the lower margin green, while the wings are entirely without clouds on the crossveins and fork. The male is like the female in color, the large eye facets pale tan, well differentiated and demarcated from



the small and occupying 1/2 to 2/3 of eye area. The small facets are purple with a single narrow green band.

The species bites cattle and horses, and is taken in Shannon traps. It is recorded from all parts of Panama at low elevations, mostly in forested regions, though not by any means confined to a forest habitat. It is not a rare species, but is never a dominant one. Specimens have been taken in all months of the year. The range is from Guatemala to northern Colombia, Venezuela and Trinidad, though there are few records north of Panama.

### ***Tabanus punctipleura* Hine**

***Tabanus punctipleura*** Hine 1920, Ohio J. Sci., 20(8): 314-315, female, Costa Rica. Fairchild, 1946. Ann. Ent. Soc. Amer., 39(4): 569-570, female, figs. 4, a, b. Panama, full references; 1984, Contr. Amer. Ent. Inst. 21(3): 33-34, Map 4.

***Tabanus defilippii***: Kroeber, (sic) 1929, Zool. Anz., 83(1-4): 126-127 fig. 8. Not ***defilippii*** Bellardi, misident.

This is one of the largest species of Tabanidae in Panama and can be recognized readily by the dark brown, grayish pruinose, unicolorous abdomen, brownish wings and strong patch of dense erect black pile on the prescutellum which is bounded laterally by prominent white hair tufts. The pleura also bear a tuft of black hairs below the wing bases. It is likely to be confused only with ***T. defilippii***, as Kroeber did, but the long tooth on antenna, and lack of black pile on scutellum will easily separate ***punctipleura***. The eye in life is uniformly light yellowish green. I have seen a male from Costa Rica, P. Serre coll., in Paris Mus. The upper eye facets are but slightly enlarged and poorly demarcated from small facets, occupying less than half eye area. There is a small wedge-shaped tubercle between eyes at vertex. The palpi are brown, porrect, with a small nipple at apex. The antennae are more slender and lack the ventral angle found in female, but color and general appearance is the same.

In Panama the species has only been taken in the vicinity of Almirante, Bocas del Toro prov., biting a horse and in a Shannon trap. It is not common there, though specimens were taken from April to Nov. It was not secured at our Yellow Fever Camp during two years of intensive collecting in earlier years, but only at localities along the railroad in low or cut-over areas. It appears to have a very restricted distribution, as all records are from the Atlantic coast of Costa Rica or adjoining northwestern Panama.

### ***Tabanus pungens* Wiedemann**

***Tabanus pungens*** Wiedemann 1828, Auss. Zweifl. Ins. 1: 175. Fairchild, 1971, Cat. S. A. Dipt. Fasc. 28, p. 100. (synonymy). Goodwin and Murdoch, 1974 Ann. Ent. Soc. Amer., 67(1): 124, figs 19, 41. Wilkerson, 1979, Cespadesia 8(31-32): 394-386. Coscaron 1979, Obra Cent. Mus. de la Plata, 6: 270, figs.

***Tabanus angustivitta***: Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 165, Pl. 1, fig. 7. 1942 op. cit. 35(1): 88. Seasonal distribution.

This species is easily recognized in the Panama fauna by the presence of a discrete tubercle at vertex, and an abdominal pattern which consists of a mid-



dorsal row of narrow connected pale triangles on a broad black middorsal stripe. The sides of the abdomen are pale, reddish yellow, with a row of prominent oblique pale-haired patches. The eyes in life are purple with two transverse green bands. The male has the eye facets differentiated into two sizes, the large facets in a central triangular patch, occupying about 1/2 the eye area, and there is a prominent tubercle at vertex.

The species is fairly abundant at low elevations in the Canal Zone and generally throughout the country in open areas. It attacks horses and cattle, but not man, and is a dominant species in horse-baited stable traps. Males are frequently taken in light traps. In Panama it occurs throughout the year, but is definitely more abundant in the dry season, from December to May. It appears to range from Texas to Argentina, but is absent from Chile and the West Indies.

Goodwin and Murdoch reported the larvae as abundant. They reared over 100. Larvae were found in the same habitats as **dorsovittatus** and **colombensis**, but on both sides of the Isthmus.

### **Tabanus quinquepunctatus** Hine

**Tabanus quinquepunctatus** Hine 1925, Occ. Papers Mus. Zool. Univ. Michigan No. 162, p. 33. **Nom. nov. pro T. quinquemaculatus** Hine 1907. Fairchild, 1958. Ann. Ent. Soc. Amer., 51(6): 529, fig. 3; 1971, Cat. Dipt. S. Amer. Fasc. 28, p. 100, synonymy.

**Tabanus quinquemaculatus** Hine, 1907, Ohio Nat., 8(2): 224. Not Hine 1904.

This is a small black species with a prominent row of small middorsal white triangles on abdomen and the tergites white-margined behind, black femora but reddish tibiae which are at least partly white-haired, and grayish hyaline wings. All material seen from Panama was taken in light traps at elevations of over 1000 ft. in Chiriqui or Cocle provinces, as listed by me in 1958 (loc. cit.). I have also seen 3 females in U.S.N.M. from Potrerillos, Chiriqui prov., D.V. Brown coll. Specimens were taken in December, January and March. the species ranges north to Guatemala, but seems nowhere common, perhaps because of its apparently nocturnal habits.

### **Tabanus rhizophorae** Fairchild

**Tabanus rhizophorae** Fairchild 1943, Ann. Ent. Soc. Amer. (1942) 35(4): 449-450, fig. 6, male, female, Panama; 1973, Proc. Ent. Soc. Washington, 75(3): 319-320, fig 1.

An inconspicuous small species with steel grey thorax, yellowish-brown abdomen with traces of median and dorsolateral pale-haired stripes on well preserved examples. The frons is quite broad, the eyes green or greenish black in life, without pattern. The male is similar, though more yellowish and with more obviously striped abdomen. The eyes have enlarged facets occupying about 1/2 eye area, but not well demarcated from the small facets. The type series was taken sweeping salt marsh grass on the intertidal mud flats near Old Panama, a locality now much modified by the growth of the city. It has also been netted flying about the collector in a few other mangrove coastal habitats along the Pacific coast in Panama prov. A single defective specimen lacking antennae



from Coiba Id., off the coast of Chiriqui prov. may be the same, though the frons is slightly narrower. All material was taken in the period Jan. to July, with most specimens from Feb. to April. The species is not known outside Panama.

### **Tabanus rixator** Fairchild

**Tabanus rixator** Fairchild 1943, Ann. Ent. Soc. Amer., (1942)(4): 448, fig. 10, female, Panama; 1958 Ann. Ent. Soc. Amer., 51(6): 530, in part; 1973, Proc. Ent. Soc. Washington, 75(3): 321-322, fig. 5.

This little species is distinguished from **nereus** and **nondescriptus** by having the frontal callus broadly clavate or pear-shaped, and a prominent broad yellow-haired stripe the full length of the abdomen. Only the type and the 2 first specimens mentioned in 1958, plus 1 female taken in a mangrove swamp in the outskirts of Panama City, 3 Dec. 1964, are certainly this species. The paratypes are not now before me, and may be in part **nondescriptus**. From the scanty records, the species seems confined to coastal mangrove swamps on the Pacific coast of Panama and flies during the rainy season, from July to December. The eyes in life are bronzy green, unbanded. It has not, as yet, been taken outside Panama.

### **Tabanus rubripes** Macquart

**Tabanus rubripes** Macquart 1838, Dipt. Exot., 1(1): 134, female, Cayenne. Fairchild, 1964, J. Med. Ent., 1(2): 184-185, fig. 7, female, Paraguay, Brasil, Colombia, Panama; 1971, Cat. S. Amer. Dipt., Fasc. 28, p. 101, synonymy. Wilkerson, 1979, Cespidesia 8(31-32): 386.

Only a single specimen of this species has been taken in Panama, at Cerro Azul, Panama Prov., 6 May 1961. It somewhat resembles in size and general appearance **T. pseudoculus** Fchld., but lacks the prominent black hair spot on scutellum and has a narrower frons and callus. Both species have an appendix on fork of third vein and narrowed first posterior cell. The eye in life has two bands and the extreme lower margin green, the upper band narrower than the lower, the bands seemingly wider than in **pseudoculus**. Although Philip (1960) states that the eyes of the synonymous **T. lophus** Phil. have 2 narrow purple bands on a greenish ground, I believe this is due to a reversal in color sometimes seen when the pattern is revived. The male, according to Philip, has the enlarged eye facets well demarcated from the small and occupying the upper 2/3 of eye, with a small tubercle sunken between eyes at vertex. South American specimens have been taken in Shannon traps and attacking man. The species ranges south to Paraguay east of the Andes, but was not taken on the Western side of the Andes in Colombia during intensive collecting near Buenaventura, by Lee et. al. (1969) or Wilkerson (op. cit.).

### **Tabanus stenocephalus** Hine

**Tabanus stenocephalus** Hine 1906, Ohio, Naturalist 7(2): 27. Fairchild 1983, Ent. Soc. Amer. Misc. Pub. No. 57, p. 28, figs.



**Tabanus lineola** var. **stenocephalus**: Fairchild 1942, Ann. Ent. Soc. Amer. 35(2): 175, Pl. 2, fig. 26.

**Tabanus dorsiger** ssp. **stenocephalus**: Fairchild, 1971, Cat. Dipt. S. Amer. 28: 92.

This species is readily separated from **occidentalis** var. **dorsovittatus** by having the bases of at least hind femora contrastingly black, an integumental spot or patch of black both above and below at base of second abdominal segment, and scutellum wholly black. In addition, the abdominal markings are usually darker yellow while the upper facets of the male eye are not differentiated or demarcated from the small facets. The eye of the female in life generally lacks the short upper dark band. **Stenocephalus** is not so abundant as the forms of **occidentalis** and in Panama is almost confined to areas of heavy rainfall on the Atlantic side of the isthmus and in Darien province. Though it was taken frequently in the banana areas of Bocas del Toro Prov., intensive collecting in primary forest at our Yellow Fever Station a few miles away did not yield specimens. The bulk of our material came from horse-baited stable traps, biting horses, or in buildings or Shannon traps.

The species ranges from Guatemala to eastern Peru and Surinam, but I have seen no typical examples from south of the Amazon basin.

#### **Tabanus surifer** Fairchild

**Tabanus (Chelotabanus) surifer** Fairchild, 1964, J. Med. Ent. 1(2): 183-184. M. F. Panama, Colombia. Wilkerson, 1979, Cespedesia 8(31-32): 386-389.

**Tabanus thiemeana surifer** Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28, pp. 102-103, synonymy.

**Tabanus bigoti** Bellardi: Fairchild, 1942. Ann. Ent. Soc. Amer., 35(4): 442. figs. 5, 5a, 5b. Female, in part, var. A.

This species differs from **T. thiemeanus** End. only in having the basal plate of antenna largely or wholly yellow orange, and in having the dorsal spine much shorter, often no more than an erect tooth. From **bigoti** and **macquarti**, the 2 related species in Panama, it differs in brown frontal callus, brown frontal and facial pollinosity and yellowish brown tinted wings with a long appendix on fork of third vein. The abdomen is usually black only on sixth and seventh segments, not sharply black from fifth on as in **bigoti**.

The eyes of both sexes are bronzy in life, without pattern. The males, taken only attracted to light, have a small area of large facets in the middle of the eye, poorly differentiated and demarcated from the small facets. There is a small tubercle sunk between the eyes at vertex.

**T. surifer** is the most abundant of this group in Panama, occurring throughout the country in lower montane forest or areas of heavy rainfall, primarily along the Caribbean coast and mountains on the Pacific side. It has been taken biting man, horses and pigs, but generally is taken in Shannon and Malaise traps at ground level, often being the commonest species in its preferred habitat. Records indicate it flies from January to September, though apparently more abundant from April to August, during the first half of the rainy season.

Recent material of both **surifer** and **thiemeanus** taken in the Dept. of Valle, Colombia at Anchicaya Dam, 10 Aug. 1973, by Wilkerson and Young, show that both forms may fly together and **surifer** thus cannot be a subspecies of



**thiemeanus** as I had listed it in the Catalogue (Fairchild 1971). Males of **surifer** also differ from males of what I believe are **thiemeanus** and **macquarti** Schin. by having an area of differentiated large facets in the upper half of the eye. This area is not sharply differentiated from the small facets surrounding it, but very evident. Males of **thiemeanus** and **macquarti** wholly lack enlarged eye facets. The group to which **surifer** belongs is dominant in the andean region of Colombia and Ecuador from where several additional nominal taxa have been described, but specific limits await a careful analysis of long series from a variety of localities.

### **Tabanus vittiger guatemalanus** Hine

**Tabanus guatemalanus** Hine, 1906, Ohio Nat., 7: 21-24. Male, female, Guatemala.

**Tabanus vittiger guatemalanus:** Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 180, Pl. 1, fig. 16. Female, Panama; 1983, Ent. Soc. Amer. Misc. Pub. No. 57, p. 30, figs.

**Tabanus vittiger caymanicus** Fairchild, 1942. Ann. Ent. Soc. Amer., 35(2): 180-181. Male, female, Cayman Islands; Cuba.

**Tabanus truquii:** Bequaert, 1940, Rev. Ent. 11(1-2): 352-357, fig. 30. Not Bellardi 1859. Cayman Islands; Puerto Rico.

**Tabanus bellardii** Szilady, 1926. Biol. Hung. 1(7): 23, Pl. 4, fig. 15. Female, Cuba.

**Tabanus vittiger bellardii:** Pechuman, 1957, Ent. News, 68(5): 118. Florida.

**Tabanus subsimilis guatemalanus:** Philip, 1965, Ann. Ent. Soc. Amer., 58(6): 877. Fairchild, 1971, Cat. S. Amer. Dipt. Fasc. 28, p. 102.

The female of this species can generally be separated from **occidentalis** and its forms by the markedly broader frons, and generally broader abdominal stripes. The male has the upper facets greatly enlarged and short pilose. Both sexes have wholly yellow to red mid and hind femora. From **colombensis** Macq. It can be separated by slightly broader and more convergent frons and yellowish vestiture in the female, and by the enlarged facets and wholly pale femora in the male. **Colombensis** has the abdominal stripes chalky white, and the male eye without markedly enlarged facets, though they are also pilose. The eye pattern of the female consists of 2 purple bands on a green ground, one across the middle of the eye, the other covering the lower fifth of the eye.

In Panama the species is not abundant, though it appears to occur outside of the forest at low elevations along the coast throughout much of the country. Nearly all specimens seen were taken in horse-baited mosquito traps, the few males in light traps, and most of the records are from the vicinity of the Canal Zone, where such traps have been chiefly used. In this area, the species seems about equally abundant on both sides of the isthmus. The species appears to fly throughout the year, though limited catches suggest it may be more abundant in April and May. The present subspecies occurs from Florida to Puerto Rico, and from southern Mexico to the Guianas, Trinidad, and northern Brazil. It seems to be strictly coastal in habits.



***Tabanus unistriatus* Hine**

***Tabanus unistriatus*** Hine 1906, Ohio Nat., 7(2): 28. Fairchild, 1942, Ann. Ent. Soc. Amer., 35(2): 162, Pl. 1, fig. 2 (References); 1976, Studia Ent., 19(1-4): 240, 242, 260, 261, fig. 15. Wilkerson, 1979, Cespedia 8(31-32): 391-393.

The black abdomen with single narrow median pale stripe, wholly bare subcallus, and small size enable easy recognition of this species. The eyes are reddish purple with 3 blue-green bands, the bands about the same width as the intervals between them, while the two upper bands are joined, or separated by a narrow isthmus, at their outer ends. The male has the abdomen reddish brown on first 3 segments, often with faint indications of sublateral stripes. The head is wider than thorax, the upper eye facets greatly enlarged, occupying fully half the eye area and well demarcated from the small facets. There is no tubercle at vertex. Males were taken in a light trap.

In Panama the species seems to occur only in areas of high rainfall in the western half of the Republic. There are records from Chiriqui prov. near the Costa Rican border, Bocas del Toro prov. and from Sta. Fe in the mountains of Veraguas prov. At our Yellow Fever station near Almirante, Bocas del Toro prov., where continuous collections were made for 2 years, this was the second most abundant species, 1349 specimens being taken attracted to man and in a Shannon trap. Its peak abundance came from May to August though some were taken in every month. It was seldom taken after dark except for a few males, and but 2 specimens were secured in tree-top collections. This collecting station was in heavy primary forest, as were the other localities where the species has been taken. It seems to be rare or absent in the banana plantations and open areas in the same general region, and only a few specimens were taken at a jungle camp on the Rio Changena at 2400 ft. only a few miles away. The species ranges from Guatemala to Ecuador, west of the Andes.

***Tabanus unipunctatus* (Bigot)**

***Atylotus unipunctatus*** Bigot, 1892. Mem. Soc. Zool. France, 5: 663. Female, Amer. meridional.

***Tabanus unipunctatus***: Kertész, 1900, Cat. Tab. Orb. Terr. Univ. p. 76. Fairchild 1971, Cat. S. Amer. Dipt. Fasc. 28, pp. 103-104, synonymy. Wilkerson, 1979, Cespedia 8(31-32): 390-391.

***Tabanus fumomarginatus***: Dunn, 1934, Psyche 41(3): 174, female, Panama. Not Hine 1920, misident.

***Tabanus piraticus*** Fairchild, 1942, Psyche, 49(102): 15-16, figs. 7, a, b. Female, Panama; 1953, Proc. Ent. Soc. Washington 55(5): 241.

This species can be readily separated from related species in Panama by the unusually slender black or dark brown third antennal segment, often heavily brown tinted wings and almost unicolorous dark yellowish brown abdomen, with but a faint dull yellowish middorsal stripe, or series of vague triangles. The legs, including fore tibiae are nearly uniformly dark brown. The eyes in life are dark greenish black, without bands. Badly rubbed specimens may be confused with ***T. lacajaensis*** Kroeber, the differences discussed under that species.

The male is similar to the female in color, the enlarged eye facets well demarcated from the small and occupying about half the eye area, the eyes uni-



formly dark bronzy. The palpi are brown, densely dark-haired, inflated and slightly pointed.

The species is limited to areas of heavy forest, primarily where rainfall is abundant, but occurs throughout Panama where these conditions exist at low to moderate elevations. It is attracted to man, but there seem no records of its actually biting, though it may well do so. It has been taken biting mules at night and in Shannon traps. In the forest it flies mainly at ground level, though it is occasionally attracted to men working on platforms in the forest canopy. The 2 males, 1 from Almirante, Bocas del Toro prov. and the other from Rio Tacarcuna, Darien, were both taken at light, one in December, the other in July. All our records are from May to December, during the rainy season, and it is often abundant in suitable localities. The range is from Chiapas, Mexico to Buenaventura, Colombia. The Mexican specimens are considerably paler and smaller than those from further south.

### ***Tabanus xenorhynchus* Fairchild**

***Tabanus xenorhynchus*** Fairchild 1947, Ann. Ent. Soc. Amer., 39(4): 572-573, Fig. 1, Male, Female, Panama, Costa Rica, Guatemala; 1984, Contr. Amer. Ent. Inst. 21(3): 35-36, Map 7.

This large strikingly marked species is easily recognized by the white scutellum and white spots on tergites 2, 4, and 5 combined with a wing with strong large spots on all cross veins and fork of third vein, plus strong infuscation on base and apex. It has been taken sparingly in Chiriqui, Canal Zone, San Blas and Darien, the females frequently in the forest canopy, the males attracted to light. It probably flies throughout the year, as females have been taken in March, May and August, males in April, July and December. The known range is from Panama to Guatemala. The structurally similar ***T. basilaris*** Krob. and ***T. subviolaceus*** Fchld. occur in Brazil.



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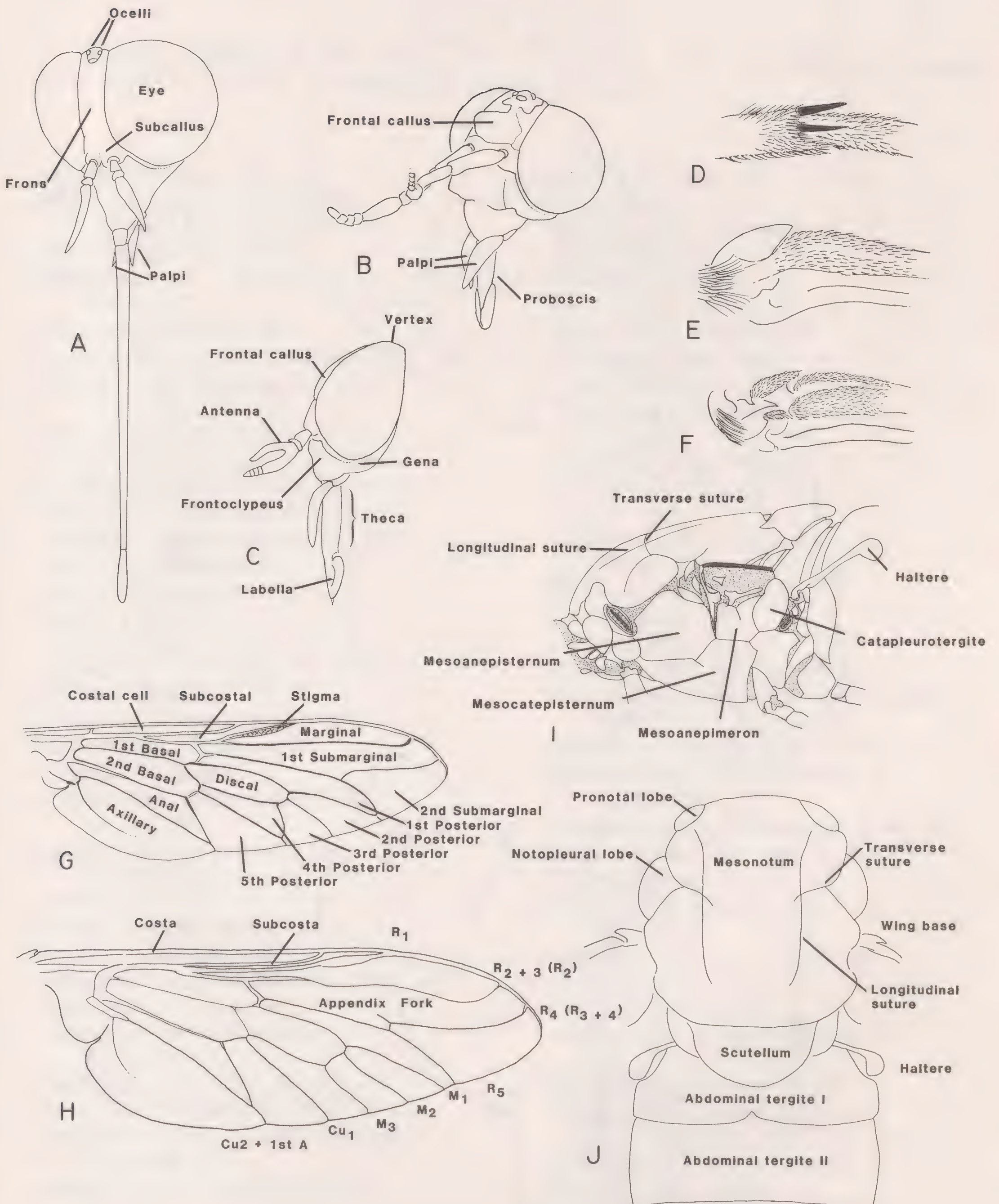
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#### EXPLANATION OF FIGURE 1

Fig 1A-J General horsefly morphology.

- Fig. 1A. Head, **Fidena auribarba**.
- Fig. 1B. Head, **Chrysops variegata**.
- Fig. 1C. Head, side view, **Dasychela badia**.
- Fig. 1D. Apex of hind tibia of **Fidena flavipennis** showing paired tibial spurs.
- Fig. 1E. Base of wing of **Fidena flavipennis** showing bare basicosta and setose base of costal vein.
- Fig. 1F. Base of wing of **Tabanus nebulosus** showing setose basicosta and base of costal vein.
- Fig. 1G. Wing of **Scione costaricana** with the cells labeled according to Curran. Note the closed and petiolate first and fourth posterior cells and anal cell.
- Fig. 1H. Wing of **Tabanus pseudoculus** with the veins named according to Comstock-Needham. Note the appendix of fork of third vein and coarctate first posterior cell.
- Fig. 1I. Side view of thorax of **Poeciloderas quadripunctatus**.
- Fig. 1J. Dorsal view of thorax and first 2 abdominal segments of **Tabanus nebulosus**.







MAP OF PANAMA  
(Courtesy Margo Duncan)





## TAXONOMIC INDEX

Names thought to be valid are in boldface, page numbers of primary references to Panama species are in boldface.

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